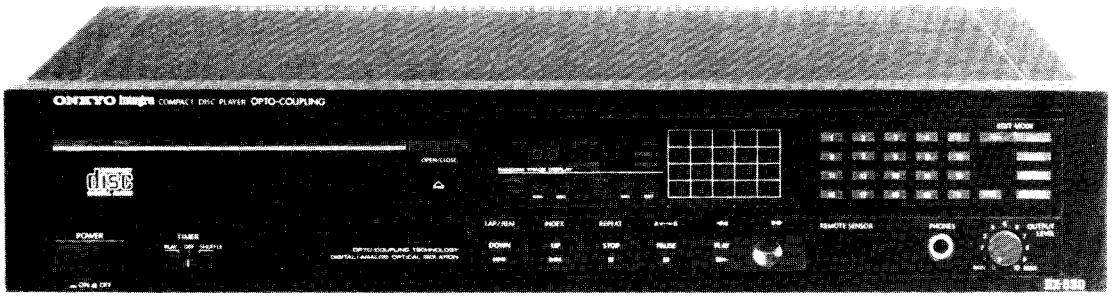
DX-530

SERIAL NO. 3270

ONKYO® SERVICE MANUAL

COMPACT DISC PLAYER
MODEL DX-530



Black model

BUDN, BUD	120V AC, 60 Hz
BUG	220V AC, 50Hz
BUU, BUUX	110/120/220/240V AC, 50/60Hz
BUQA, BUQB	240V AC, 50 Hz

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

SPECIFICATIONS

Signal readout system:	Optical non-contact
Reading rotation:	About 500~200 r.p.m. (constant linear velocity)
Linear velocity:	1.2~1.4m/s
Error correction system:	Cross interleave readsolomon code
Decoded bits:	16 bits linear
Sampling frequency:	88.2kHz (two-times oversampling)
Number of channels:	2 (stereo)
Frequency response:	2Hz~20kHz
Total harmonic distortion:	0.003% (at 1kHz)
Dynamic range:	93dB
Signal to noise ratio:	96dB
Channel separation:	90dB (at 1kHz)
Wow and Flutter:	Below threshold of measurability
Power comsumption:	17 watts
Output level:	2 volts r.m.s.
Dimensions (W x H x D):	435 x 92 x 364mm 17-1/8" x 3-5/8" x 14-5/16"
Weight:	5.6kg, 12.3 lbs.

Specifications are subject to change without notice.

ONKYO
AUDIO COMPONENTS

SERVICE PROCEDURES

1. Removing the Locking Plate

Locking plate is located on the bottom panel of this unit. Before using this unit for the first time, the plate must be removed. If power is switched on while this part is still in place, the unit will not operate properly

1. Locking plate
2. Tapping screw

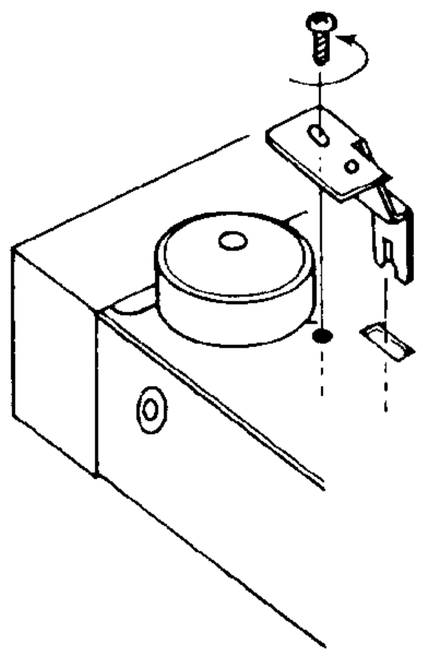


Fig. 1

2. Safety-check out (U.S.A. model)

After correcting the original service problem, perform the following safety check before releasing the set to the customer:

Connect the insulating-resistance tester between the plug of power supply cable and chassis.

Specifications: more than 10Mohm at 500V.

3. Procedures for replacement of flat packaged ICs

1. Tools to be used:

(1) Soldering iron . . . . Grounded soldering iron or soldering iron with leak resistance of 10 Mohms or more.

Form of soldering iron's tip:

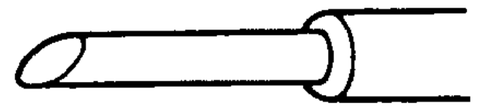


Fig. 2

(2) Magnifying glass . . . for checking of finished works

(3) Tweezers . . . . . for handling of IC and forming of leads

(4) Grounding ring . . . . Countermeasure for electrostatic breakdown

(5) Nipper . . . . . for removing defective IC

(6) Small brush . . . . . for application of flux

2. Work Procedures:

(1) Remove the defective IC

Cut all leads of the defective IC one by one using a nipper and remove the IC.

(2) Clean the pattern surface of the PC board.

Get rid of the remaining leads and solder.

(3) Check and from the leads of the new flat packaged IC to be installed.

From every lead on the new IC using a pair of tweezers, so that all of them are aligned neatly without being risen, twisted or inclined toward one side. Especially the rising portion of every lead must be formed with greatest care.

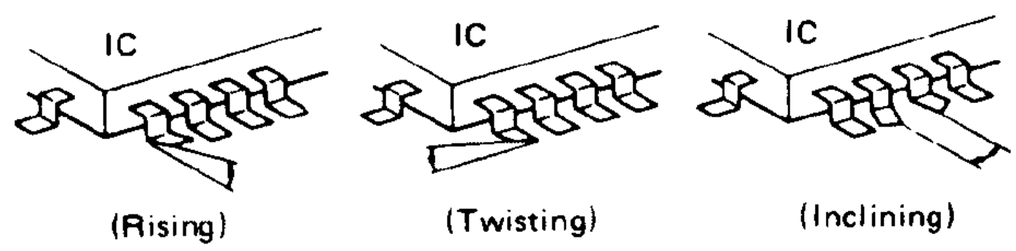


Fig. 3

(4) Apply flux to the PC board.

Apply flux to the pattern surface of the PC board which has been cleaned, as shown in the illustration. The area to be applied with flux is the portion of about 2.5mm in width where the IC's leads are to be soldered.

Be careful to apply minimum amount of flux required so as not to smear it on unwanted areas.

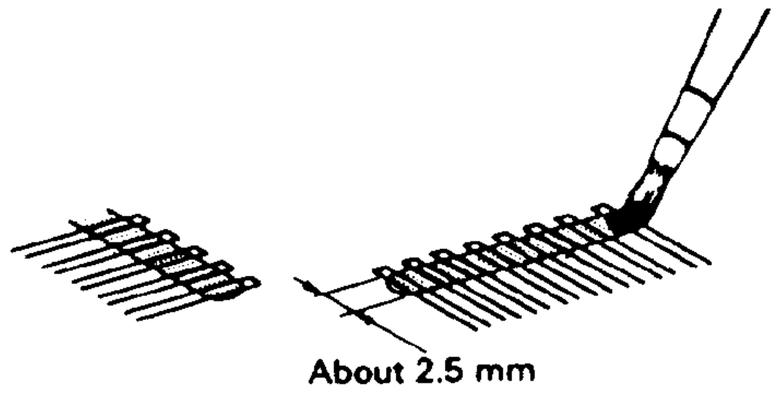


Fig. 4

(5) Temporarily tighten the IC

Carefully align the pattern and IC's leads, so that the IC will be temporarily tightened to the pattern on the four leads at the corners. At this time, soldering is required, but no need to apply soldering material.

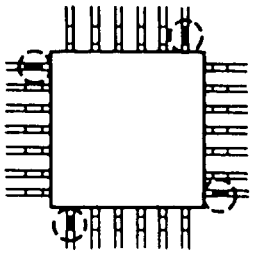


Fig. 5

(6) Apply flux to IC's leads

Apply flux to the areas of IC's leads where soldering is to be performed. Be careful not to smear flux on the root portion of any lead or the body of IC.

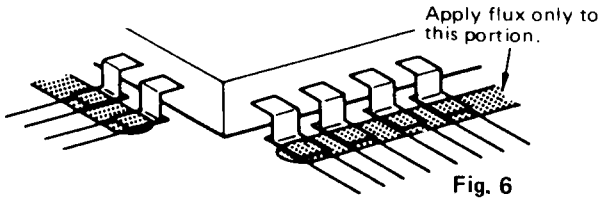


Fig. 6

(7) Soldering

While attaching the tip of the soldering iron to the soldering point as shown in the illustration, feed 2 –5mm of soldering wire. Then, slowly move the iron in the direction indicated by the arrow in the illustration, so that the leads will be soldered to the pattern. Move the iron in the rate of approximately 1cm in 5sec. Proceed with your work while confirming a clean fillet of solder is formed on each lead, subsequent to the melting of flux.

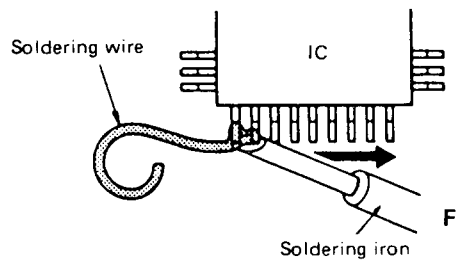


Fig. 7

CAUTION

1) If you move the iron too quickly, loose soldering is likely to result.
2) Be especially careful when soldering the first lead where loose soldering is most liable to be formed.

(8) Check the results

When soldering of all leads is finished, check the soldered portion on every lead with a magnifying glass. A tester must not be used or checking of any soldered position

NOTE ON COMPACT DISC

- **Holding Compact Discs**

Hold Compact Discs by the edges so that you do not touch the surface of disc. Remember that the side of the disc with the "rainbow" reflection is the side containing the audio information.

Do not attach tape or paper to the label side of the disc and always be careful not to leave fingerprints on the side that is played.

- **Storing Compact Discs**

Store Compact Discs in a location protected from direct sunlight, high heat and humidity and extremely high and low temperatures. Discs should never be left in the trunk or interior of an automobile in the sun since the temperature can become very high in such a closed environment.

Always store Compact Discs in the holders in which they were sold. Never leave a disc in the player's disc holder for a long period of time.

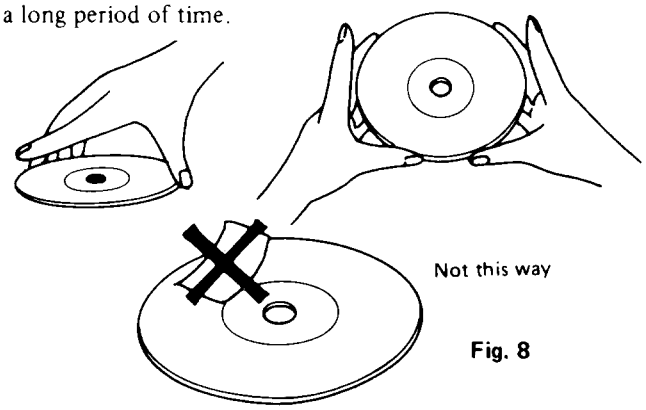


Fig. 8

- **Cleaning Compact Discs**

Before playing a disc wipe off the playing surface with a soft cloth to remove dust and other soil. Wipe the surface in straight lines from the center of the disc outward, not in a circular motion as you would with a phonograph record.

Do not use benzene, chemical cleansers or phonograph record cleaning solutions to clean Compact Discs. Also avoid static electricity prevention solutions since they can damage the surface of Compact Discs.

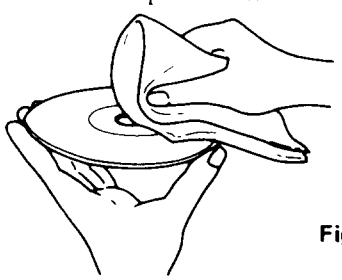


Fig. 9

Problems Caused by Dew

Dew can form inside a Compact player when it is brought from a cold environment into a warm room, when a room is rapidly heated and if a player is left in a humid environment.

This dew can prevent the laser pickup from reading the data contained in the pits in the disc surface. If the player does not operate properly because of dew, remove the disc and leave the player's power switch on for about one hour to remove all moisture.

PROTECTION OF EYES FROM LASER BEAM DURING SERVICING

This set employs a laser. Therefore, be sure to follow carefully the instructions below when servicing.

WARNING!!

WHEN SERVICING, DO NOT APPROACH THE LASER EXIT WITH THE EYE TOO CLOSELY. IN CASE IT IS NECESSARY TO CONFIRM LASER BEAM EMMISION, BE SURE TO OBSERVE FROM A DISTANCE OF MORE THAN 30cm FROM THE SURFACE OF THE OBJECTIVE LENS ON THE OPTICAL PICK-UP BLOCK.

Laser Diode Properties

- Material: GaAS/GaAlAs
- Wavelength: 780nm
- Emission Duration: continuous
- Laser output: max. 0.5mW*

  *This output is the value measured at a distance about 1.8mm from the objective lens surface on the Optical Pick-up Block.

LASER WARNING LABEL

The label shown below are affixed.

1. Warning label

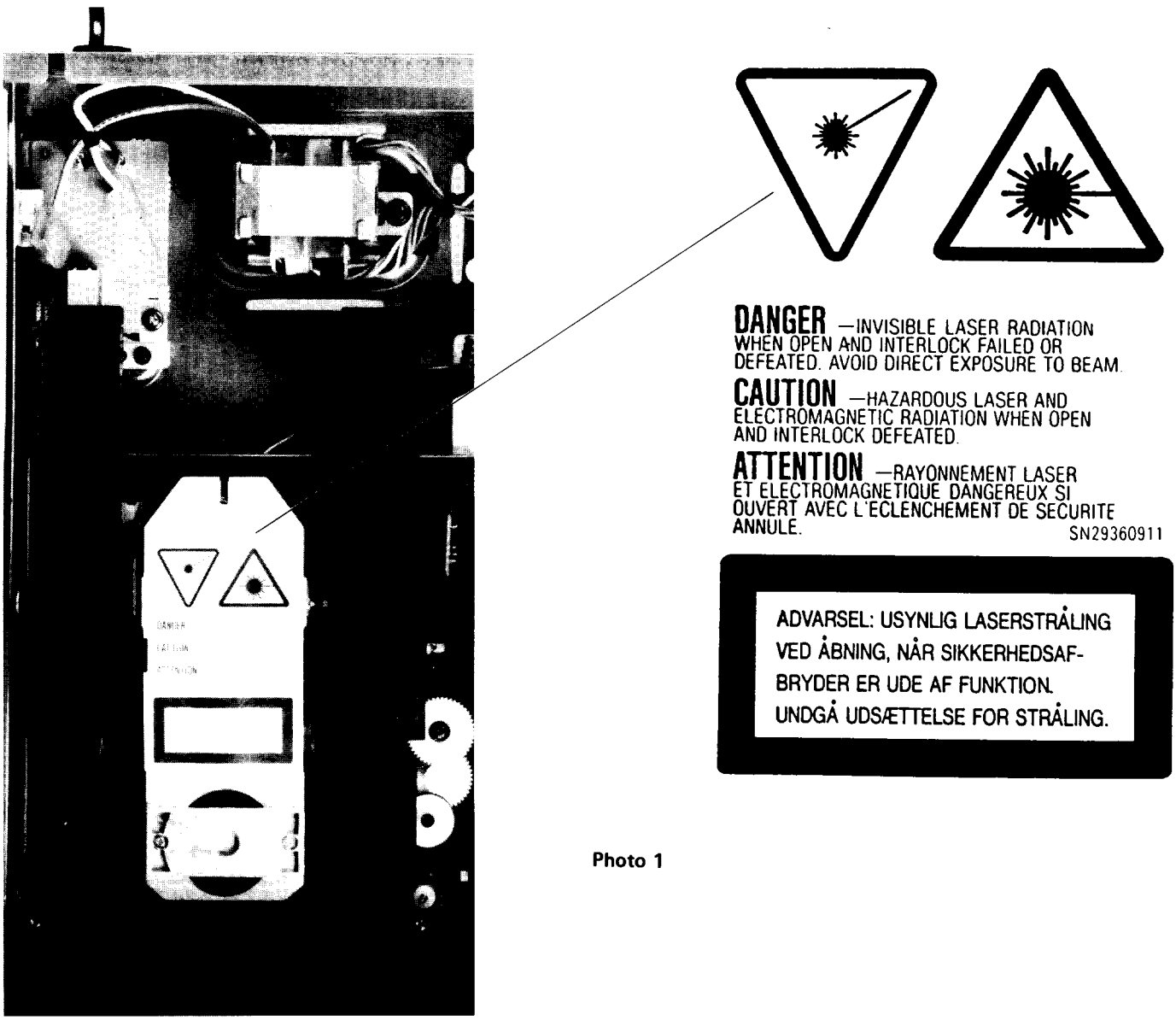

DANGER —INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCK FAILED OR DEFEATED. AVOID DIRECT EXPOSURE TO BEAM.
CAUTION —HAZARDOUS LASER AND ELECTROMAGNETIC RADIATION WHEN OPEN AND INTERLOCK DEFEATED.
ATTENTION —RAYONNEMENT LASER ET ELECTROMAGNETIQUE DANGEREUX SI OUVERT AVEC L'ECLENCHEMENT DE SECURITE ANNULE.
SN29360911
ADVARSEL: USYNLIG LASERSTRÅLING VED ÅBNING, NÅR SIKKERHEDSAF-BRYDER ER UDE AF FUNKTION. UNDGÅ UDSÆTTELSE FOR STRÅLING.

Photo 1

2. Certification label (UD: 120V model)

This label is located on the back panel.

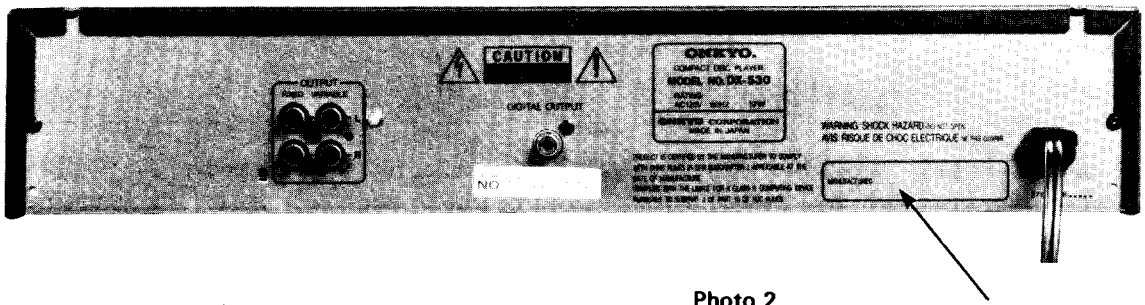


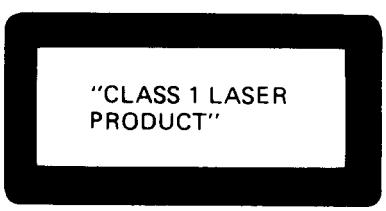
Photo 2

3. Class 1 label (Other models)

This label is located on the back panel.

Photo 3

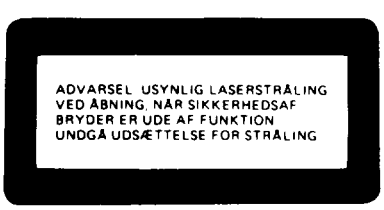
ADVARSEL



Denne mærkning er anbragt på apparatets højre side og indikerer, at apparatet arbejder med laserstråler af klasse 1, hvilket betyder, at der anvendes laserstråler af svageste klasse, og at man ikke på apparatets yderside kan blive udsat for utilladelig kraftig stråling.

APPARATET BØR KUN ÅBNES AF FAGFOLK MED SÆRLIGT KENDSKAB TIL APPARATER MED LASERSTRÅLER!

Indvendigt i apparatet er anbragt den her gengivne advarselsmærkning, som advarer imod at foretage sådanne indgreb i apparatet, at man kan komme til at udsætte sig for laserstråling.



VAROITUS! Laite sisältää laserdiodin, joka lähettää (näkymätöntä) silmille vaarallista lasersäteilyä.

Fig. 10

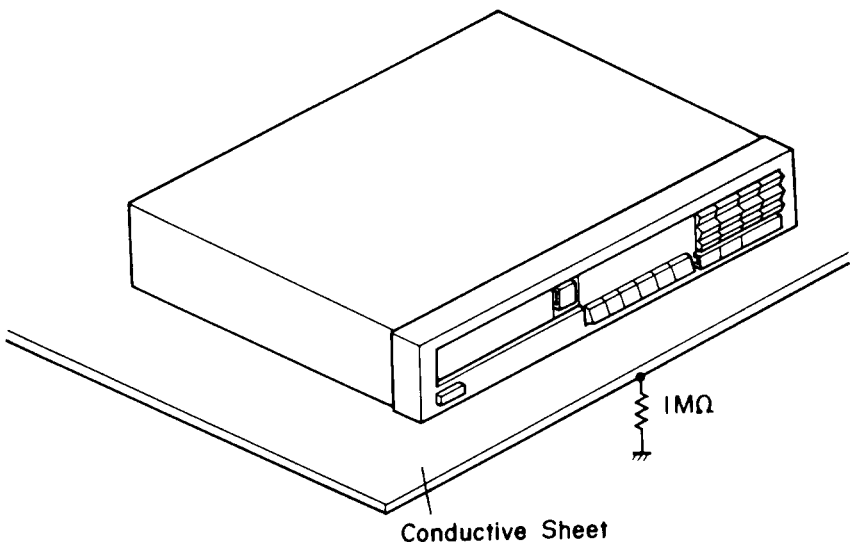
CAUTION ON REPLACEMENT OF PICK-UP

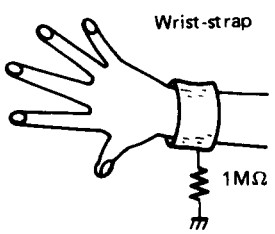
The laser diode in the optical pick-up block is so sensitive to static electricity, surge current and etc. that the components are liable to be broken down or its reliability remarkably deteriorated.

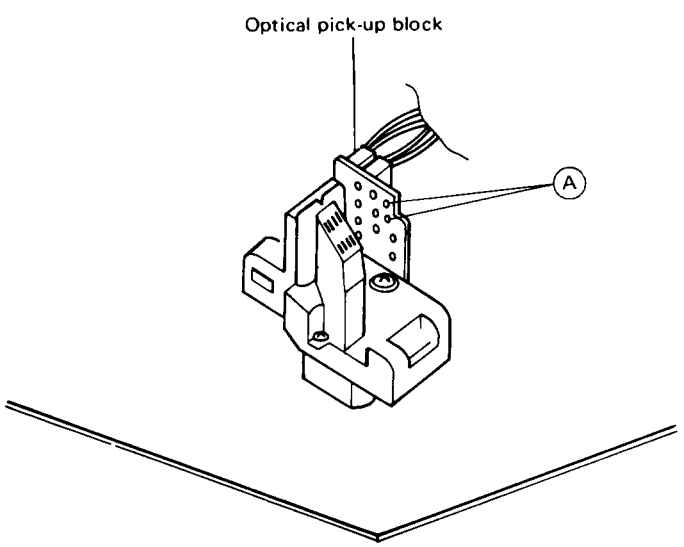
During repair, carefulley take the following precautions. (The following precautions are included in the service parts).

PRECAUTIONS

1. **Ground for the work-desk.**
   Place a conductive sheet such as a sheet of copper (with impedance lower than $10^6\Omega$) on the work-desk and place the set on the conductive sheet so that the chassis.
2. **Grounding for the test equipment and tools.**
   Test equipments and toolings should be grounded in order that their ground level is the same the ground of the power source.
3. **Grounding for the human body.**
   Be sure to put on a wrist-strap for grounding whose other end is grounded.
   Be particularly careful when the workers wear synthetic fiber clothes, or air is dry.
4. **Select a soldering iron that permits no leakage and have the tip of the iron well-grounded.**
5. **Do not check the laser diode terminals with the probe of a circuit tester or oscilloscope.**





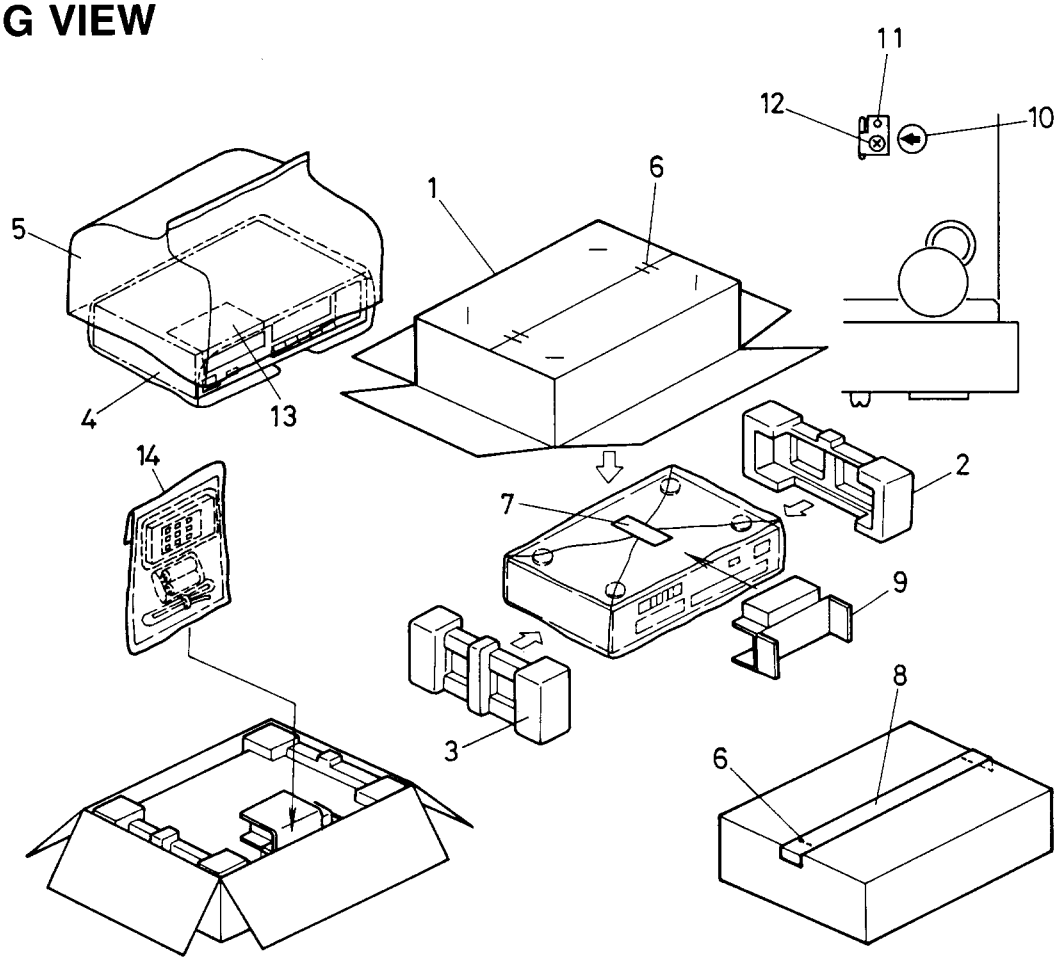


Disconnection
To solder (A) position before removing the optical pick-up.

Connection
The optical pick-up KSS-152A of service part has a protective solder bridge for (A) position. That must be removed after connecting the pick-up.

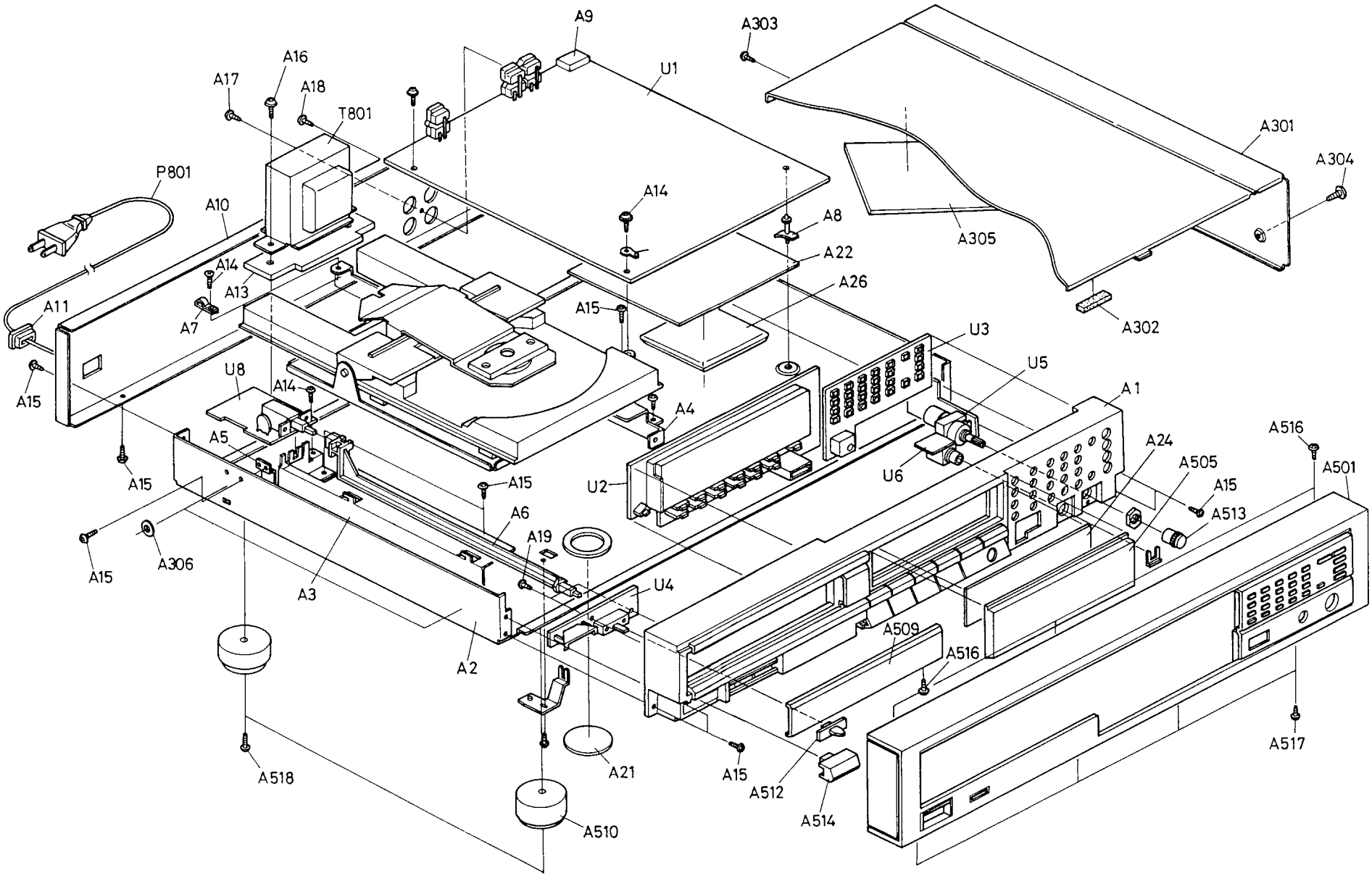
Fig. 11

PACKING VIEW



REF. NO.	PART NO.	DESCRIPTION
1	29051508	Master carton box
2	29091110A	Pad L
3	29091111A	Pad R
4	29095012-1	800X500mm, Protection sheet
5	29100036A	550X850mm, Poly-vinyl bag
6	282301	Sealing hook
7	261504	Adhesive tape
8	260012	Damplon tape
9	29091170	Pad F
10	29360833	Label
11	27141103A	Locking plate
12	834430068	3TTS+6B(BC), Tapping screw
13	29360907	Label, locking plate
14	Accessary bag ass'y	
	-120V model-	
	29341139	Instruction manual
	2010097	Connection cord
	24140004	RC-106C, Remote control unit
	3010054	UM-3, Two batteries
	29100097	250X350mm, Poly-vinyl bag
	29365019	Warranty card (Only U.S.A. model)
	29358002E	Service station list (Only U.S.A. model)
	-220V/240V/Universal models-	
	29341140	Instruction manual
	29341170	Instruction manual, Italian (Only 220V model)
	2010097	Connection cord
	24140004	RC-106C, Remote control unit
	3010054	UM-3, Two batteries
	29100097	250X350mm, Poly-vinyl bag
	25055040	CV-K-2, Conversion plug (Only Universal model)

EXPLODED VIEW



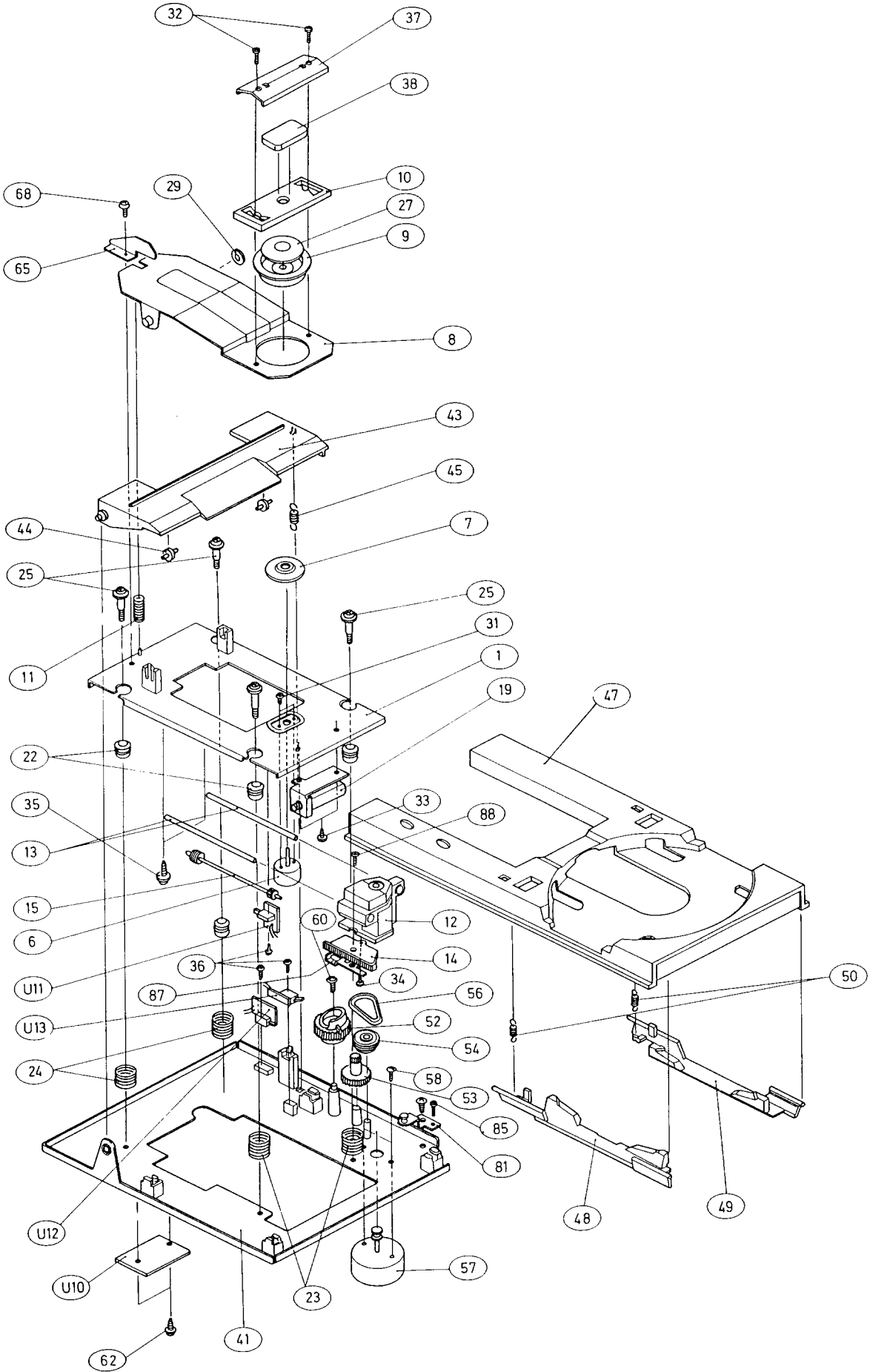
EXPLODED VIEW – PARTS LIST

REF.NO.	PART NO.	DESCRIPTION
A1	27110355	Front bracket
A2	27100131A	Chassis
A3	27130466	Bracket L
A4	27130467	Bracket R
A5	27141125	Bracket S
A6	27273057A	Joint
A7	27255001	Clamper for lead wire
A8	27190009	Holder
A9	28140773	Cushion
A10	27120978	Back panel <D>
	27120979	Back panel <G>
	27120981	Back panel <U>
	27121021	Back panel <Q>
A11	27300750	⚠ Strainrelief
A13	27270214	Spacer
A14	831130088	3TTW+8B, Tapping screw
A15	834430068	3TTS+6B(BC), Tapping screw
A16	830440109	4TTC+10C(BC), Tapping screw
A17	834430108	3TTS+10B(BC), Tapping screw
A18	834230108	3TTS+10B(Ni), Nickel screw
A19	833430080	3TTP+8P(BC), Tapping screw
A21	27270193	Spacer
A22	28140753A	Cushion
A24	28133180	Back plate
A26	28140754-1	Cushion ass'y
A301	28184339	Top cover
A302	28140020	Cushion
A303	834430068	3TTS+6B(BC), Tapping screw
A304	838440089	4TTB+8C(BC), Tapping screw
A305	28140740	Cushion
A306	27270212	Spacer
A501	1H015121	Front panel ass'y
A505	28191392	Clear plate
A509	27210847	Door
A510	27175152	Leg
A514	28322913	Timer knob
A515	28323031	Tone knob
A516	28323040	Power knob
A519	833430080	3TTP+8P(BC), Tapping screw
A520	838430088	3TTS+8B(BC), Tapping screw
A521	831430088	3TTW+8B(BC), Tapping screw
SC801	2000627D	NSAS-8P-583, Socket
SC802	2000581D	NSAS-8P-537, Socket
T801	2300221	⚠ NPT-952D, Power transformer <D>
	2300222	⚠ NPT-952G, Power transformer <G>
	2300224	⚠ NPT-952ADGQ, Power transformer <U>
T801	2300223	⚠ NPT-952Q, Power transformer <Q>
S902	25065168	⚠ HXW0131-01-060, Voltage selector switch <U>
P801	253112A	⚠ AS-UC-4 #18, Power supply cord <D/PX>
	253127B or 253129A	⚠ AS-CEE, Power supply cord <G/U>
	253118	⚠ AS-SAA, Power supply cord <Q>
U1	1H016529-2	NAAR-2929-2, Main circuit pc board ass'y
U2	1H016530-2	NADIS-2930-2, Display pc board ass'y
U3	1H016531-2	NASW-2931-2, Operation switch pc board ass'y
U4	1H016532-2	NASW-2932-2, Timer switch pc board ass'y
U5	1H016533-2	NAAF-2933-2, Output volume pc board ass'y
U6	1H016534-2	NAAF-2934-2, Headphone terminal pc board ass'y
U8	1H016536-2	NAPS-2936-2, Power switch pc board ass'y
	29360911	Label, laser
	29360687	Label, Class 1 <G/U/Q>

NOTE: <D>: Only 120V model
<G>: Only 220V model
<Q>: Only 240V model
<U>: Only Universal model
<PX>: Only PX model

NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.

MECHANISM EXPLODED VIEW



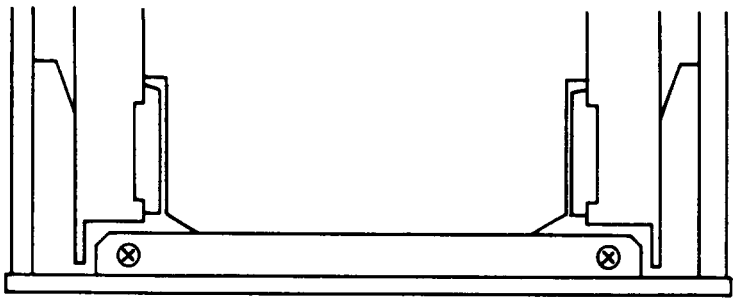
PARTS LIST

REF.NO.	PART NO.	DESCRIPTION
1	27100123A	Chassis (PU)
6	24502213	Spindle motor
7	27300889B	Turntable platter
8	27300932	Arm P
9	27300848A	Cap CH
10	27300849C	Cap holder
11	27180327	Spring
12	24110001	KSS-152A, Optical pickup
13	27260222	Shaft
14	27300897B	Rack PU
15	10498902	Shaft ass'y
19	10498903-1	Motor ass'y
22	27300854A	Cushion rubber
23	27180319	Spring
24	27180320	Spring
25	801364	Special screw
27	27270206	Spacer
29	27270203	Spacer
31	82142003	2P+3F(BC), Pan head screw
32	82112610	2.6P+10F, Pan head screw
33	834426068	2.6TTS+6B(BC), Tapping screw
34	833420068	2TTP+6B(BC), Tapping screw
35	831430100	3TTW+10P(BC), Tapping screw
36	833420108	2TTP+10B(BC), Tapping screw
37	27141138A	Bracket CAP
38	27300931	Rubber CAP
41	27100124B	Chassis
43	27300938	Arm L
44	27185019A	Roller
45	27180310B	Spring
47	27300861D	Disc tray
48	27300900	Disc lifter L
49	27300901A	Disc lifter R
50	27180311C	Spring
52	27300856B	Cam gear
53	27300857B	Flat wheel
54	27300858	Pulley gear
56	27300860	Rubber belt
57	10498901	BFT7B, Motor ass'y
58	82142604	2.6P+4F(BC), Pan head screw
60	831430100	3TTW+10P(BC), Tapping screw
62	833430080	3TTP+8P(BC), Tapping screw
65	27141098	Bracket, holder
68	834430068	3TTS+6B(BC), Tapping screw
81	27180328	Roller spring
85	833420068	2TTP+6B(BC), Tapping screw
87	27141105A	Bracket
88	82112606	2.6P+6F, Pan head screw
U10	10498544-1	NATRM-2844-1, Terminal pc board ass'y
U11	10498545-1	NASW-2845-1, Start switch pc board ass'y
(S841)	25065261	NMS-1212, Microswitch
U12	10498546-1	NASW-2846-1, Open switch pc board ass'y
(S821)	25065260	NMS-1211, Microswitch
U13	10498547-1	NASW-2847-1, Close switch pc board ass'y
(S831)	25065261	NMS-1212, Microswitch

DISASSEMBLING PROCEDURES

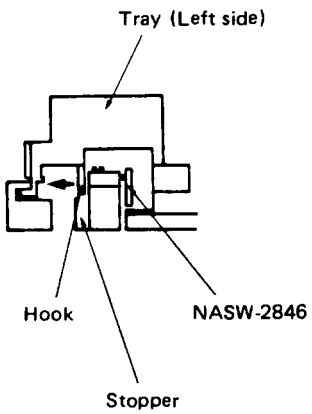
1. Tray panel removal

1) Remove the tray with pressing the OPEN/CLOSE button.
2) Turn the unit over and put it on the soft cloth.
3) Remove the two screws from the tray.



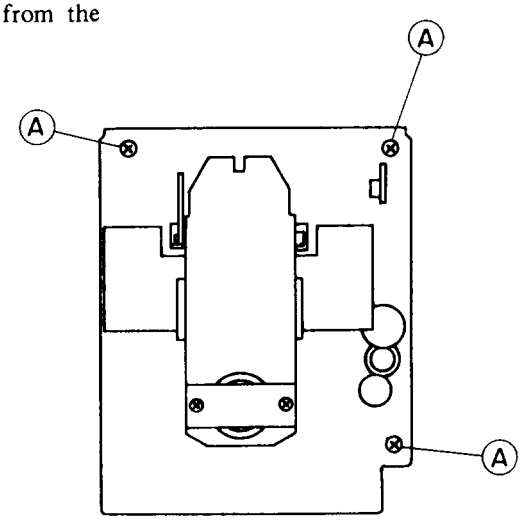
2. Tray removal

1) Remove the top cover.
2) Open the tray with pressing the OPEN/CLOSE button.
3) Release the hook of tray from stopper and pull the tray out.



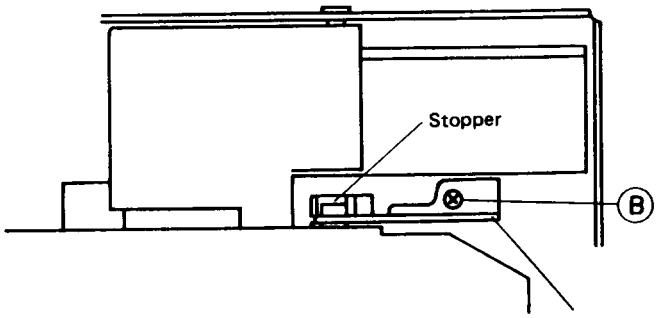
3. Mechanical chassis removal

1) Remove the top cover and tray.
2) Remove the three screws A from the mechanical chassis.
3) Remove the two connectors (P101 & P102) from the main pc board.
4) Pull the mechanical chassis out carefully.
5) Remove the two connectors (P201 & P202) from the terminal pc board.



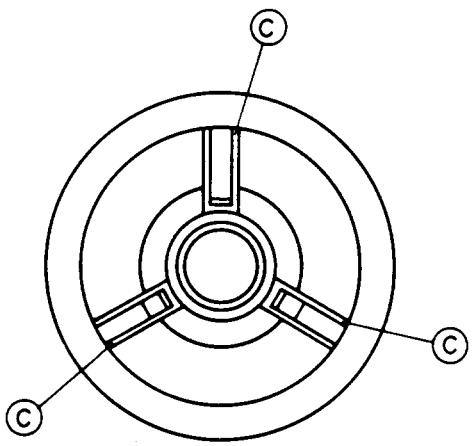
4. Arm P removal

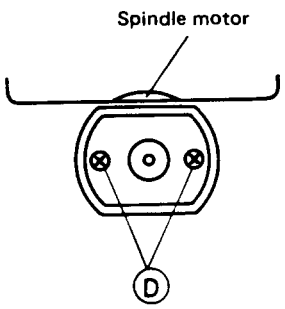
1) Remove the top cover.
2) Remove a screw B from the bracket, holder.
3) Remove the arm P from the stopper.



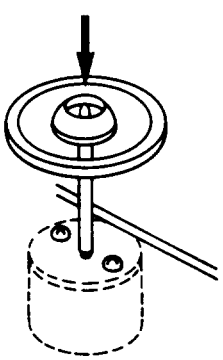
5. Replacing the spindle motor and turntable platter

1) Remove the tray and arm P.
2) Cut the points C of turntable platter with the pincers and pull it out from the shaft of spindle motor.
3) Remove the two screws D from the mechanical chassis.

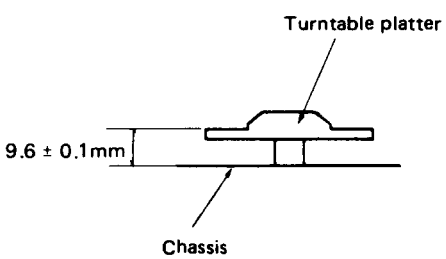




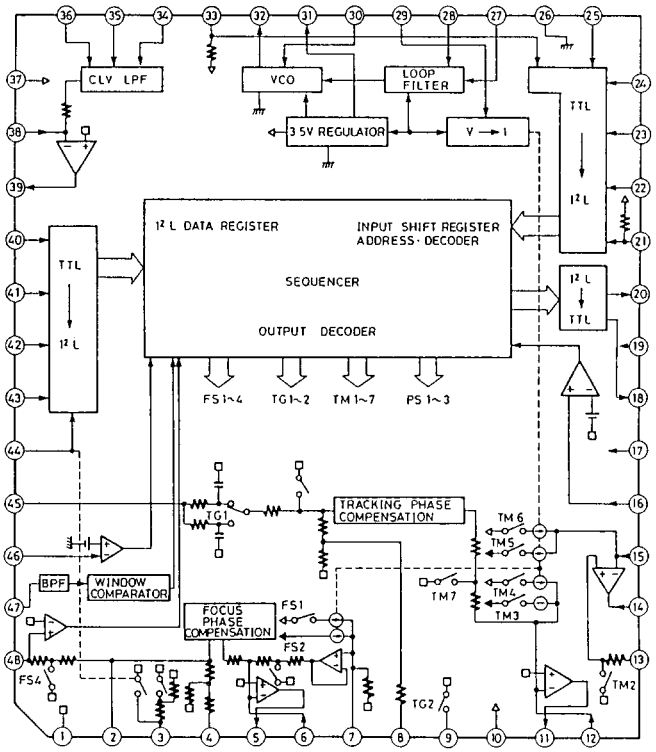
Press the center of turntable platter and insert the turntable platter in the shaft of spindle motor.



Height of turntable platter.



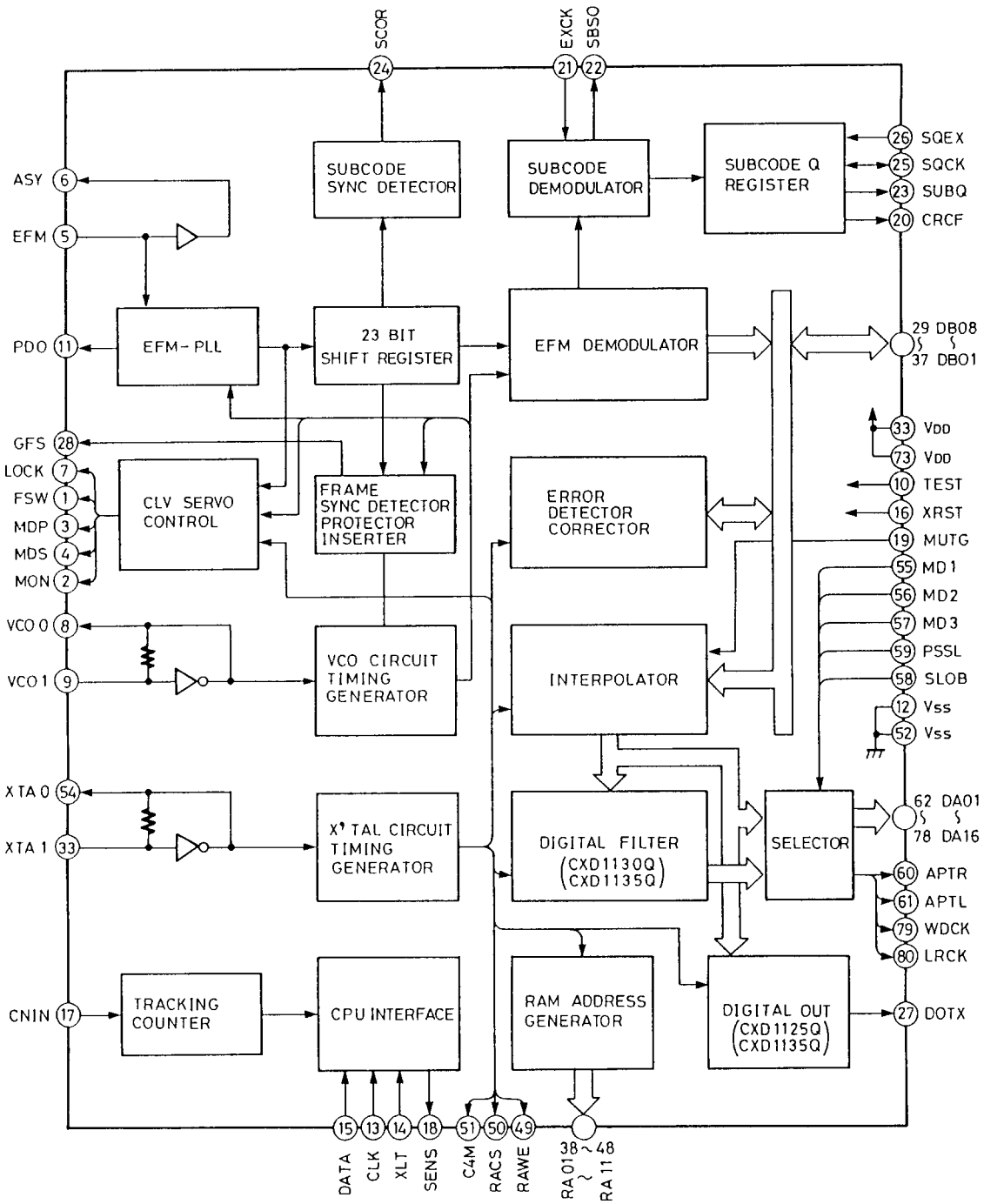
CXA1082AQ (Servo Signal Processor)



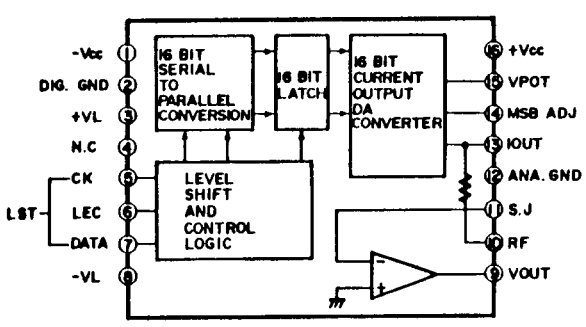
Pin No.	Symbol	Function
2	FGD	Insert the capacitor between this terminal and pin 3 when drop the high frequency gain of focus servo
3	FS3	Switching terminal of high frequency gain of focus servo
4	FLB	Time constant switching terminal when raise the low frequency gain of focus servo
5 11 14 39	FEO TAO SLO SPDLO	Operation amplifier output terminals for power transistor drive
6	FE−	Inversion input terminal of focus amplifier
7	SRCH	Time constant terminal to make the focus search waveform
8	TGU	Time constant terminal for high frequency gain switching of tracking
9	TG2	Time constant terminal for high frequency gain switching of tracking
12	TA−	Inversion input terminal of tracking amplifier
13	SL+	Non-inversion input terminal of sled amplifier
15	SL−	Inversion input terminal of sled amplifier
16	SSTOP	Limit switch ON/OFF detector signal terminal for disc innermost position detector
17	FSET	Terminal of peak of phase compensation of focus tracking and of setting of LPF
18 20	SENS C.OUT	Output terminals for microcomputer and interface
27	BW	Time constant terminal of loop filter

Pin No.	Symbol	Function
28	PDI	Input terminal of phase comparator output PDO
21 22 23 24 25 33	DIRCT XRST DATA XTL CLK LOCK	Input terminals for microcomputer and interface
29	ISET	Flow the current to decide the focus search, track jump, and kick height
30	VCOP	VCO free run frequency is proportion to resistor value between pins 30 and 31
32	C864	VCO (8.64MHz) output terminal
34	MDP	Connection terminal to terminal MDP of CXD1135Q
35	MON	Connection terminal to terminal MON of CXD1135Q
36	FSW	LPF time constant terminal of CLV servo error signal
38	SPDL−	Inversion input terminal of spindle drive amplifier
40 41 42 44	WDCK FOK MIRR DFCT	Input terminals for microcomputer and interface
45	TE	Tracking error signal input terminal
46	TZC	Tracking zero cross comparator input terminal
47	ATSC	Window comparator input terminal for ATSC detection
48	FE	Focus error signal input terminal

CXD1135Q (Digital Signal Processor)



PCM-56P (D/A Converter)

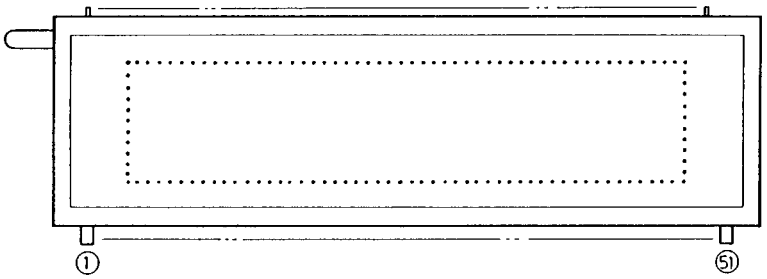


1	−Vcc	Analog power supply(−)
2	DIG GND	Digital ground
3	+VL	Logic voltage (+)
4	N.C	Not used
5	CK	Clock input
6	LEC	Latch enable input
7	DATA	Data input
8	−VL	Logic voltage (−)
9	VOUT	Output
10	RF	Feedback register
11	SJ	Operation amplifier input
12	ANA GND	Analog ground
13	IOUT	Current output
14	MSB ADJ	MSB adjustment terminal
15	VPOT	Meter terminal
16	+Vcc	Analog power supply (+)

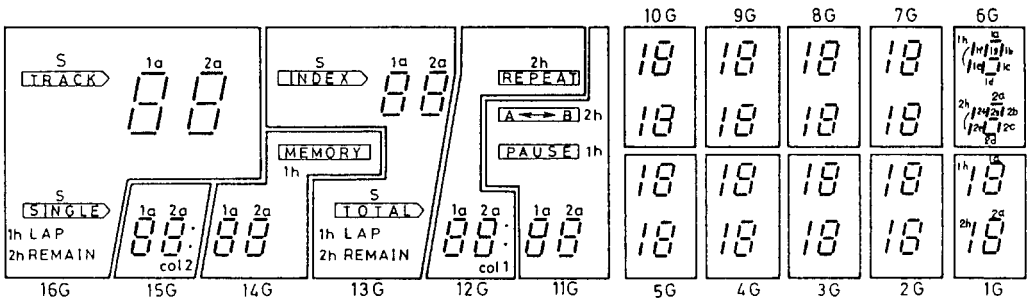
Pin No.	Symbol	Function
1	FSW	Time constant switching output terminal of output filter of spindle motor
2	MON	ON/OFF control output terminal of spindle motor
3	MDP	Drive output terminal of spindle motor. Rough control when mode CLV-S and phase control when mode CLV-P
4	MDS	Drive output terminal of spindle motor. Speed control when mode CLV-P
5	EFM	EFM signal input terminal from RF amplifier
6	ASY	Output terminal to control the slice level of EFM signal
7	LOCK	GFS sampling terminal
8	VCOO	VCO output terminal. 8.6436MHz when lock to EFM signal
9	VCOI	VCO input terminal
10	TEST	0V
11	PDO	Phase comparator output terminal of EFM signal and VCO/2
12	Vss	Ground
13	CLK	Serial data transmitter clock input terminal from microcomputer
14	XLT	Latch input terminal from microcomputer
15	DATA	Serial data input terminal from microcomputer
16	XRST	System rest input terminal. Reset at low level.
17	CNIN	Tracking pulse input erminal
18	SENS	Inner condition output terminal correspond to address
19	MUTG	Muting input terminal
20	CRCF	CRC check output terminal of subcode Q
21	EXCK	Clock input terminal for serial output of subcode
22	SBSO	Serial output terminal of subcode
23	SUBQ	Subcode Q output terminal
24	SCOR	Subcode sink S0 + S1 output terminal
25	SQCK	Clock terminal to read the subcode Q
26	SQEX	Selector input terminal of SQCK
27	DOTX	Digital output terminal
28	GFS	Indicator output of lock condition of frame sync
29 ~ 32	DB08 ~ DB05	Data terminals of external RAM
33	V_{DD}	+5V
34 ~ 37	DB04 ~ DB01	Data terminals of external RAM
38 ~ 48	RA01 ~ RA11	Address output terminals of external RAM

Pin No.	Symbol	Function
49	RAWE	Write enable signal output to external RAM
50	RACS	Chip selector signal output to external RAM
51	C4M	Divider output of crystal. f=4.2336MHz
52	Vss	Ground
53	XTAI	Input terminal of crystal oscillator
54	XTAO	Output terminal of crystal oscillator
55 ~ 57	MD1 ~ MD3	Mode switching input terminals
58	SLOB	Code switching input of audio data output.
59	PSSL	Mode switching input of audio data output. Serial output at low level. Parallel output at high level
60	APTR	Control output for aperture correction. High level when Rch.
61	APTL	Control output for aperture correction. High level when Lch.
62	DA01	DA01 (LSB of parallel sound output) output when PSSL = H. C1F1 output when PSSL = L
63	DA02	DA02 output when PSSL = H. C1F2 output when PSSL = L.
64	DA03	DA03 output when PSSL = H. C2F1 output when PSSL = L.
65	DA04	DA04 output when PSSL = H. C2F2 output when PSSL = L.
66	DA05	DA05 output when PSSL = H. C2FL output when PSSL = L.
67	DA06	DA06 output when PSSL = H. C2PO output when PSSL = L.
68	DA07	DA07 output when PSSL = H. RFCK output when PSSL = L.
69	DA08	DA08 output when PSSL = H. WFCK output when PSSL = L.
70	DA09	DA09 output when PSSL = H. PLCK output when PSSL = L.
71	DA10	DA10 output when PSSL = H. UGFS output when PSSL = L.
72	DA11	DA11 output when PSSL = H. GTOP output when PSSL = L.
73	V_{DD}	Power supply (5V)
74	DA12	DA12 output when PSSL = H. RAOV output when PSSL = L.
75	DA13	DA13 output when PSSL = H. C4LR output when PSSL = L.
76	DA14	DA14 output when PSSL = H. C210 output when PSSL = L.
77	DA15	DA15 output when PSSL = H. C210 output when PSSL = L.
78	DA16	DA16 (MSB of parallel sound output) output when PSSL = H. DATA output when PSS = L
79	WDCK	Strobe signal output. 176.4kHz when DF is on. 88.2kHz when DF is off.
80	LRCK	Strobe signal output. 88.2kHz when DF is on. 44.1kHz when DF is off.

16-MT-02GK (Fluorescent Indicator Tube)



Grid assignment

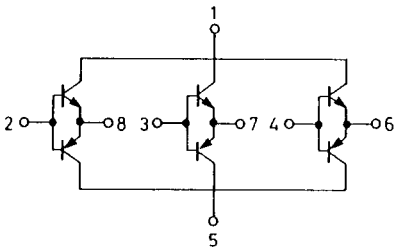


Pin connection

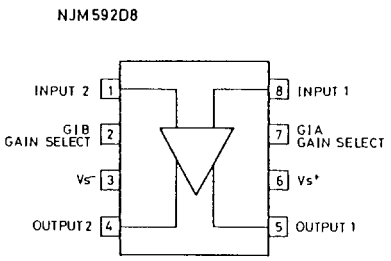
PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
CONNECTION	F 1	F 1	N P	N P	2 h	2 a	2 b	2 f	2 g	2 c	2 e	2 d	N P	N P	16 G	15 G	14 G	N P	N P	13 G	N P	N P	N P	N P	12 G	N P

PIN NO.	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
CONNECTION	11 G	10 G	9 G	8 G	7 G	6 G	N P	5 G	4 G	3 G	2 G	1 G	s	1 h	1 a	1 b	1 f	1 g	1 c	1 e	1 d	N P	N P	F 2	F 2

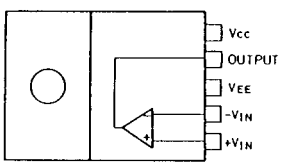
STA341M (Transistor Array)



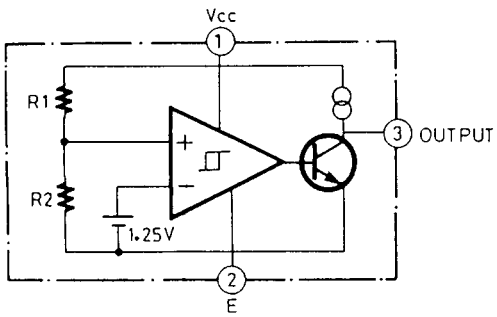
NJM592D8 (Wide Band Amp)



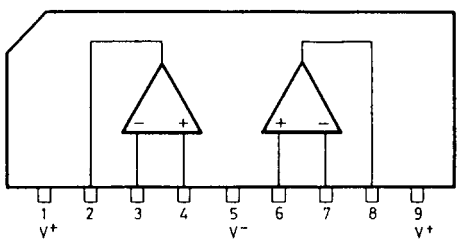
LA6500 (Power OP Amp)

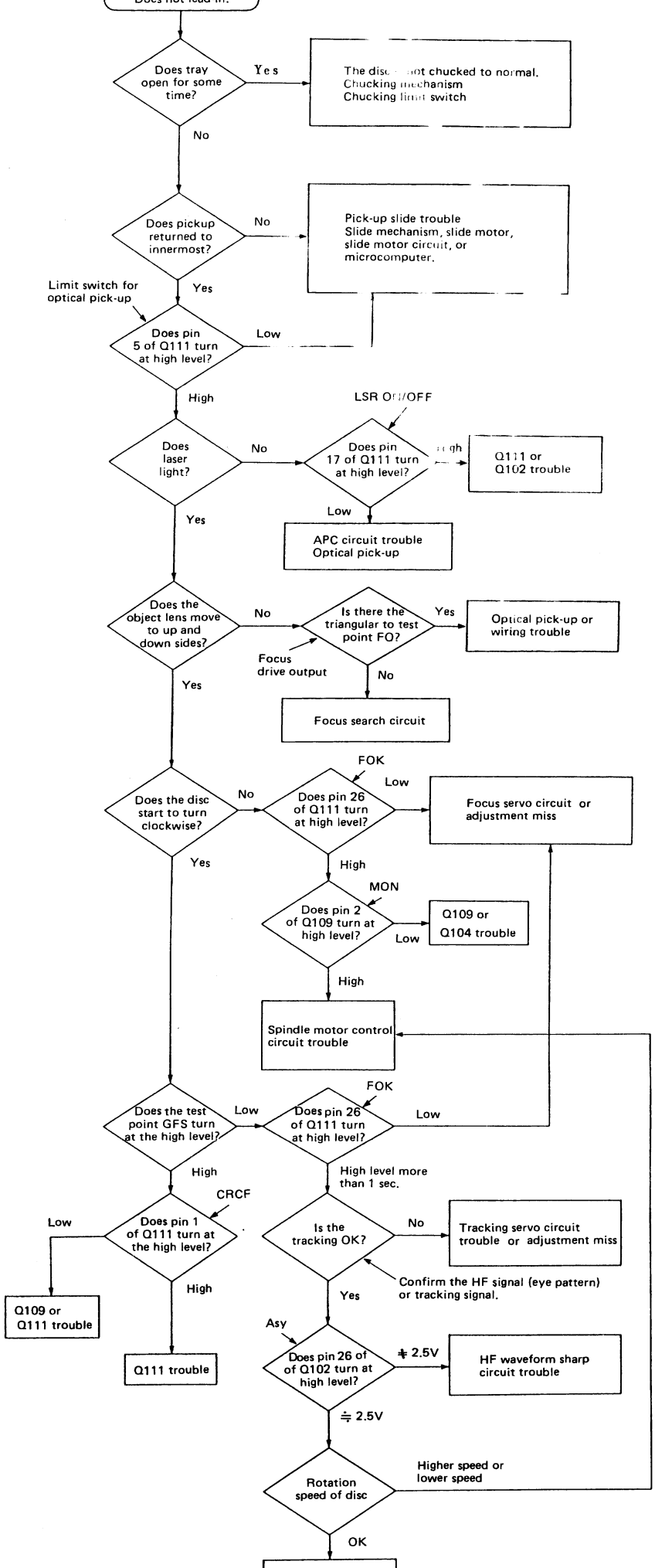


M51944ASL (System Reset)

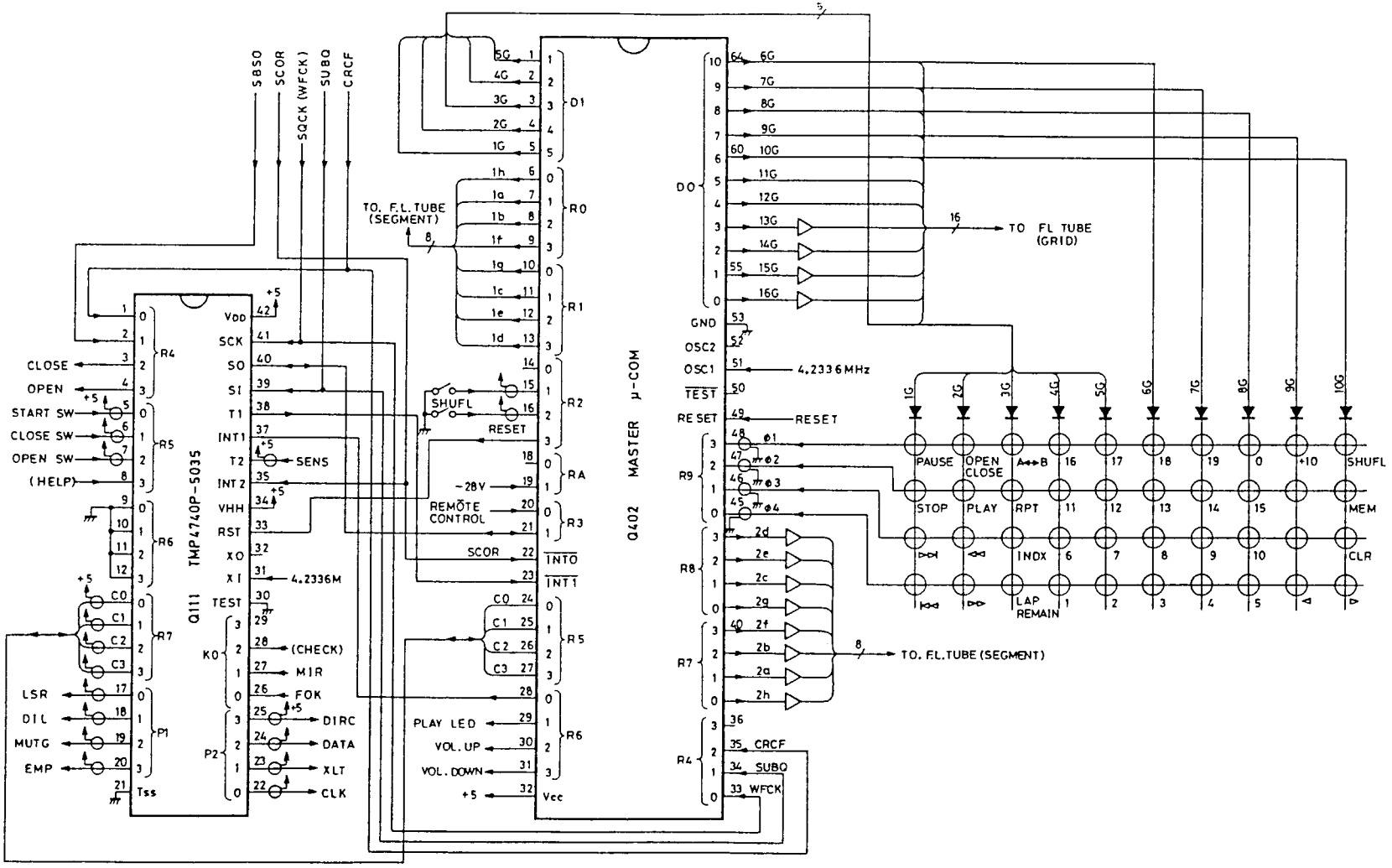


NJM072BS
NJM4558S (OP Amp)
NJM2068SD




Does tray open for some time?
Yes
The disc is not chucked to normal.
Chucking mechanism
Chucking limit switch
No
Does pickup returned to innermost?
No
Pick-up slide trouble
Slide mechanism, slide motor, slide motor circuit, or microcomputer.
Yes
Limit switch for optical pick-up
Does pin 5 of Q111 turn at high level?
Low
High
LSR ON/OFF
Does laser light?
No
Does pin 17 of Q111 turn at high level?
High
Q111 or Q102 trouble
Low
APC circuit trouble
Optical pick-up
Yes
Does the object lens move to up and down sides?
No
Is there the triangular to test point FO?
Yes
Optical pick-up or wiring trouble
Focus drive output
No
Focus search circuit
Yes
FOK
Does the disc start to turn clockwise?
No
Does pin 26 of Q111 turn at high level?
Low
Focus servo circuit or adjustment miss
Yes
High
MON
Does pin 2 of Q109 turn at high level?
Q109 or Q104 trouble
Low
High
Spindle motor control circuit trouble
FOK
Does the test point GFS turn at the high level?
Low
Does pin 26 of Q111 turn at high level?
Low
High
High level more than 1 sec.
CRCF
Low
Does pin 1 of Q111 turn at the high level?
Is the tracking OK?
No
Tracking servo circuit trouble or adjustment miss
Confirm the HF signal (eye pattern) or tracking signal.
High
Yes
Q109 or Q111 trouble
Asy
Q111 trouble
Does pin 26 of of Q102 turn at high level?
≠ 2.5V
HF waveform sharp circuit trouble
≒ 2.5V
Rotation speed of disc
Higher speed or lower speed
OK

CONNECTION DIAGRAM OF MICROCOMPUTER



CIRCUIT DESCRIPTIONS

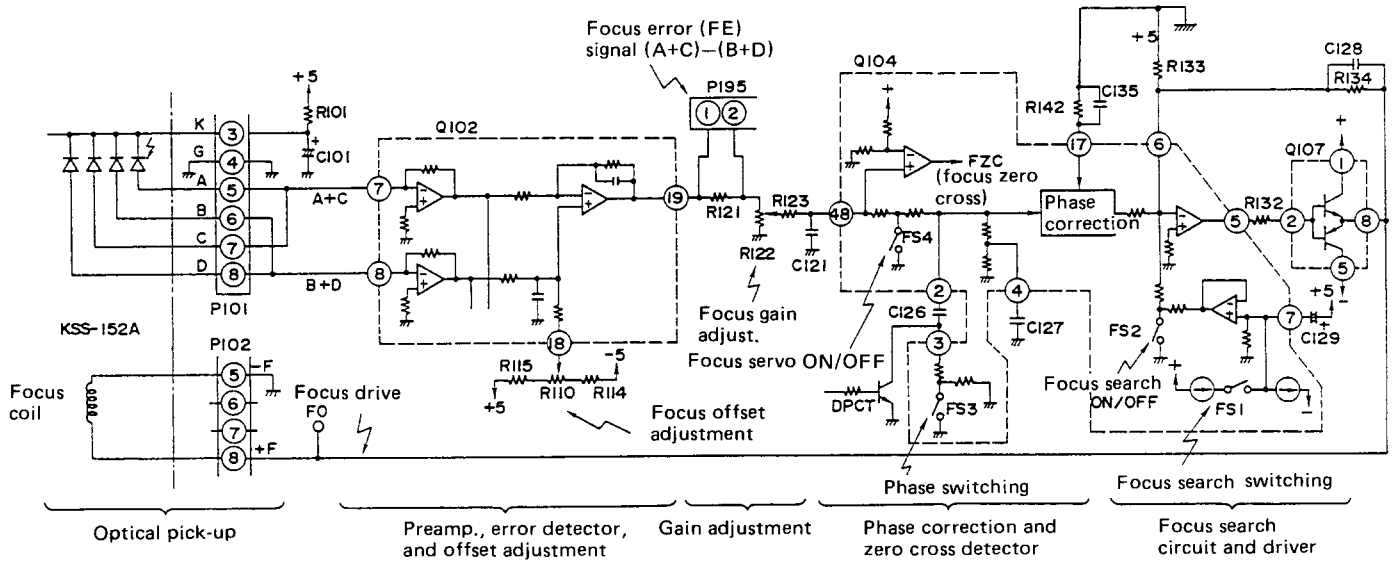


Fig. 1 Focus servo circuit

1. Focus servo circuit

From the optical pickup objective lens, the emitted laser beam is focused on the disc reflecting surface, an this circuit controls the movement of the lens up and down.

1-1. Error detecting circuit

The error is detected by means of the astignatic aberration method and obtains its focus error signal from the optical pickup output signal (A+C)–(B+D).

The individual signals (A+B) and (C+D) input to pins 7 and 8 of Q102 are subtracted by means of the IC internal op amp, and from pin 19, the F.E. signal is output. Also, in order to eliminate the focus error, offset adjustment is carried out by the semi-fixed resistor R110 of pin 18 of Q102.

1-2. Phase correction and driver circuit

By means of the semi-fixed resistor R122, the gain adjusted F.E. signal passes by way of the phase correction circuit from pin 48 of Q104, and from pin 5 of Q104 to the driver Q107, and is feedback to the coil used for driving the optical pickup KSS-152A objective lens. In addition, there are the FS4 servo ON/OFF switch and FS3 phase characteristic selector switch.

1-3. Focus zero cross circuit and focus search circuit

In order to have mandatory drive of the objective lens in the capture range of only 10μm at the focus point it is necessary to turn off the above mentioned FS4 and close the servo loop. The timing diagram for that operation is shown in Fig. 2.

The triangular wave generated by means of the focus search circuit internal to Q104 shifts the objective lens up/down direction, and at the correct focus point, the fall of F.E. signal is detected by the focus zero cross (FZC) circuit to close the servo loop. At this time, it is necessary that the focus OK (FOK) signal be in the high level. In Fig. 2, the dotted line is the waveform of the focus capture failure.

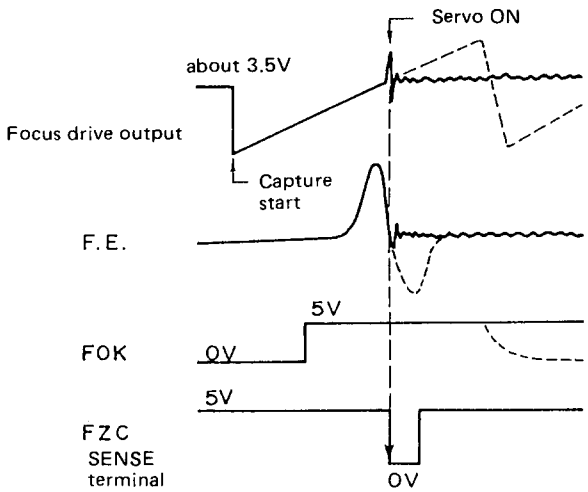


Fig. 2 Capture operation of focus

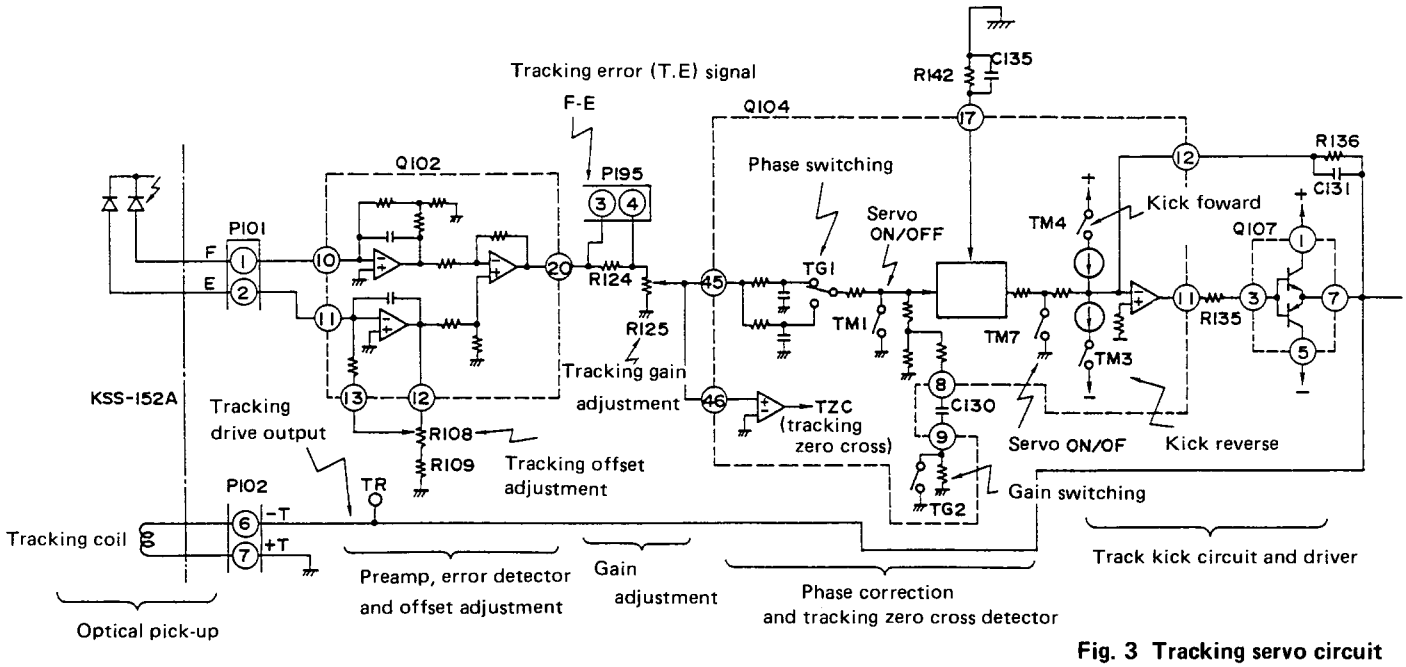


Fig. 3 Tracking servo circuit

2. Tracking servo circuit

On the disc at a pitch of 1.6μm, the laser beam accurately traces the center of the pits cut into the disc, and this is the control circuit that shifts the objective lens in the radial direction.

2-1. Error detection circuit

The F-E is obtained from the tracking error (T.E.) signal by means of a 3 beam method. The F.E. signal input to pins 10 and 11 of Q102 is subtracted internally, and is output as the T.E. signal from pin 20. R108 is the semi-fixed resistor control for tracking offset.

2-2. Phase correction and driver circuit

The T.E. signal adjusted for gain by means of the semi-fixed resistor R125 passes through the phase correction circuit from pin 45 of Q104, and from pin 11 by way of driver Q107 objective lens. TM1 and TM7 are used as the tracking servo ON/OFF switches, and TG1 and TG2 respectively are used as the phase selector and gain selector switches.

2-3. Tracking zero cross and track kick circuit

At the time the head comes out and when there is manual fast forward, in the event that is it necessary to skip over the track being traced, the T.E. signal receives a kick pulse, and by mens of this, shifting of the objective lens can be achieved.

TM3 and TM4 respectively are the switches for providing the forward and reverse direction kick pulses. Also, the tracking zero cross (TZC) circuit counts the number of tracks skipped over and produces the signal in order to determine the timing of the servo ON/OFF.

The ON/OFF command for these switches is output from the microcomputer.

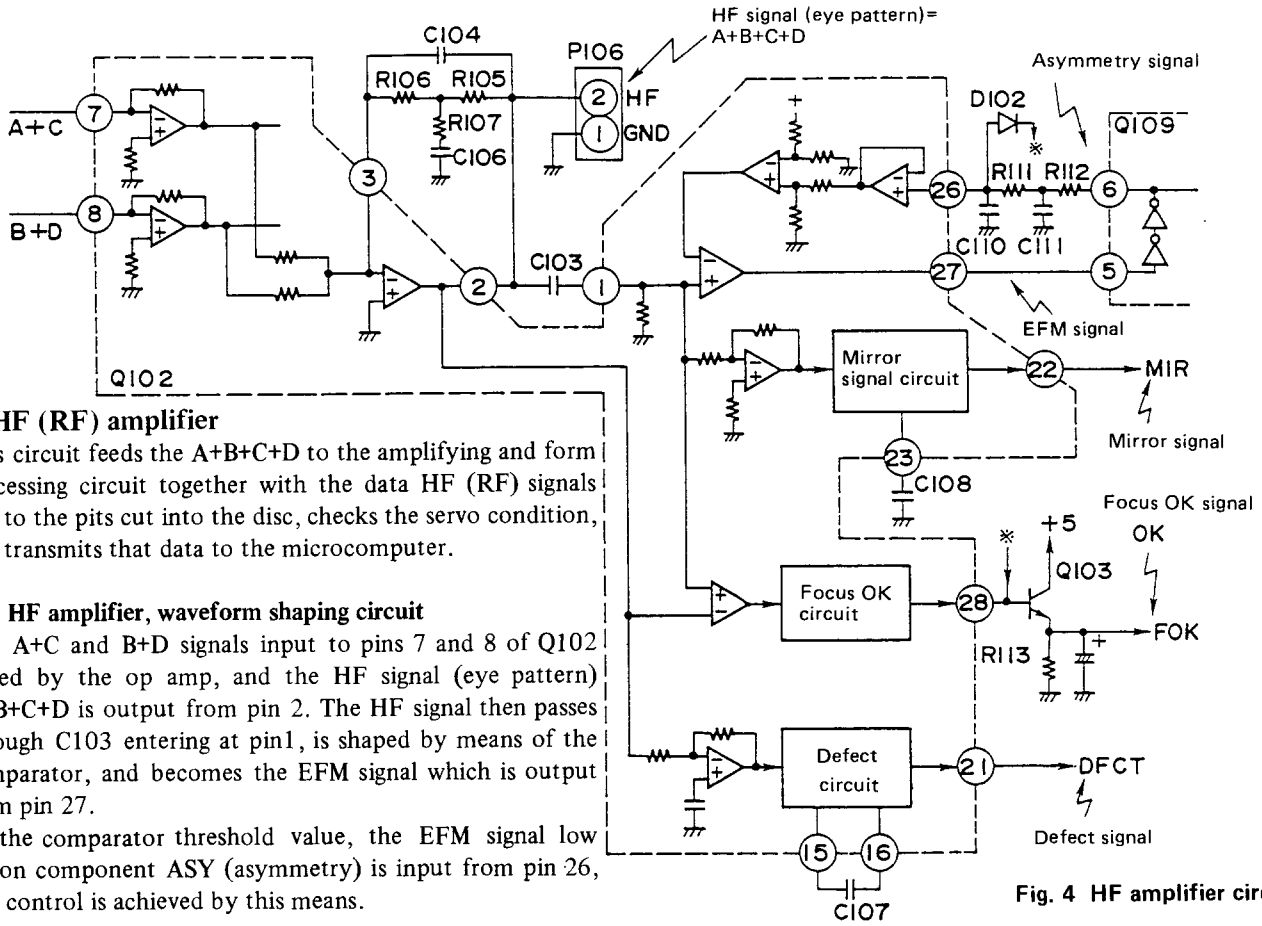


Fig. 4 HF amplifier circuit

3. HF (RF) amplifier

This circuit feeds the A+B+C+D to the amplifying and form processing circuit together with the data HF (RF) signals due to the pits cut into the disc, checks the servo condition, and transmits that data to the microcomputer.

3-1. HF amplifier, waveform shaping circuit

The A+C and B+D signals input to pins 7 and 8 of Q102 added by the op amp, and the HF signal (eye pattern) A+B+C+D is output from pin 2. The HF signal then passes through C103 entering at pin1, is shaped by means of the comparator, and becomes the EFM signal which is output from pin 27.

In the comparator threshold value, the EFM signal low region component ASY (asymmetry) is input from pin 26, and control is achieved by this means.

3-2. MIR circuit, FOK circuit, and DFCT circuit

After the HF signal is processed the detection, shaping, etc, respectively the MIR, FOK, and DFCT signals are output from pins 22, 28, and 21.

3-2-1. MIR (mirror) signal

When the head is extended, at the time the signal becomes high at the disc track and between tracks, the number of tracks is counted, and this is used for determining the timing for the ON/OFF of the servo.

3-2-2. FOK (focus OK) signal

This signal goes high at the time the focus servo is required. (Refer to 1–3)

3-2-3. DFCT (defect) signal

If there is a defect (scratch, dirt, etc.) in the disc, this signal goes high, the servo and gain are controlled, and the circuit prevents a sound outburst.

4. APC circuit

By means of feedback from the monitor, this circuit controls the light output due to a bad condition resulting from the temperature characteristic of the laser diode.

For the pin 29 LDON (laser diode ON) signal, when the APC ON/OFF control signal is LOW, the laser is emitted.

5. CLV servo circuit

In the compact disc there is a CLV system (constant linear velocity), and at the replay position, because the disc rotary speed varies, the clock is taken out of the HF signal, and

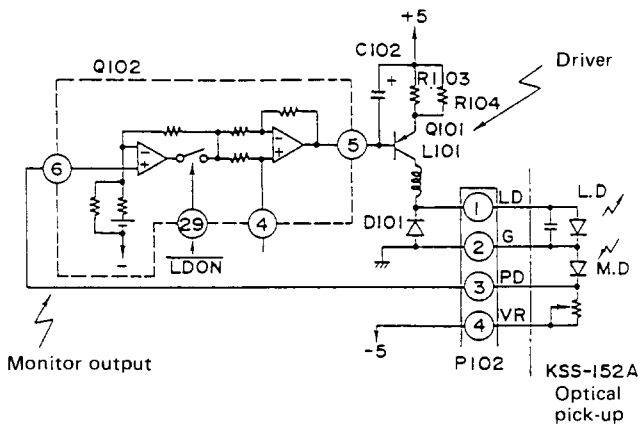


Fig. 5 APC circuit

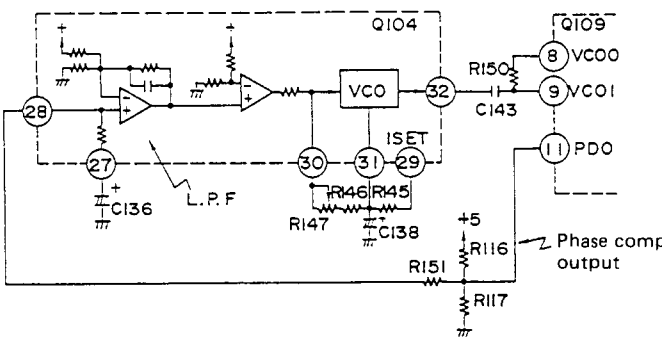


Fig. 6 PLL circuit

the PLL circuit and its clock must be synchronized to control the spindle motor.

5-1. PLL circuit

As shown in Fig. 6, for the phase comparator, in Q109 the LPF and VCO are each built into Q104. The semi-fixed resistor R147 is the control for adjusting the 8.6436 MHz free run frequency (WFCK = 7.35 KHz).

5-2. Spindle motor control circuit

The output of the phase comparator (MDP) and frequency comparator (MDS) from pins 3 and 4 of Q109 is fed to pins 34 and 36 of Q104. Also, the spindle motor ON/OFF signal (MON) from pin 2 of Q109, and the phase selector signal (FSW) from pin 1, are output and fed to pin 36 of Q104. After these signals are processed in Q104, they are passed from pin 39 through the driver Q108, and are supplied to the spindle motor.

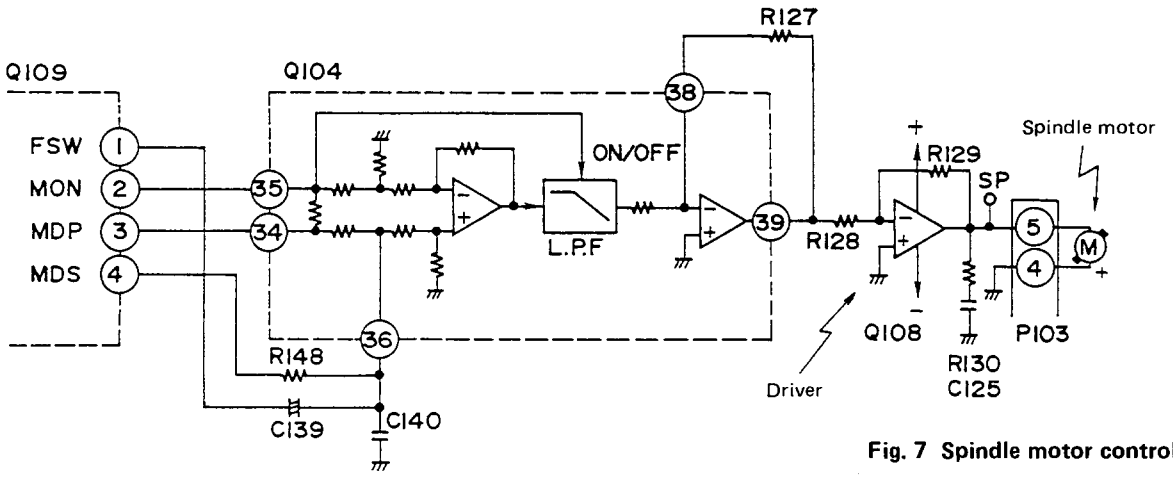


Fig. 7 Spindle motor control circuit

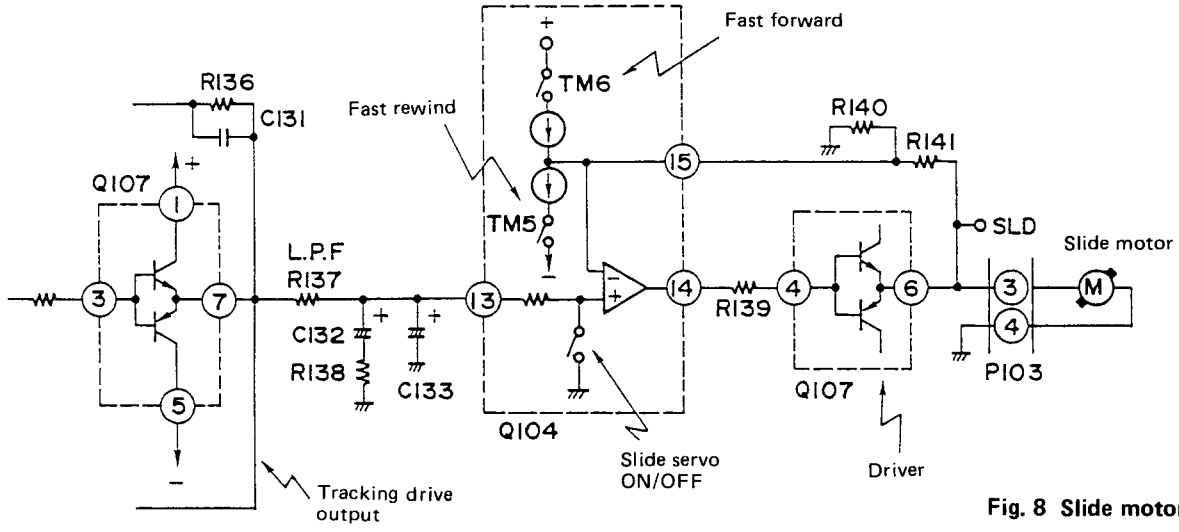


Fig. 8 Slide motor circuit

6. Slide motor circuit

This circuit controls the slide motor which is used for moving the optical pickup from inside the disc to the outside. In the normal playback time, the low region component of the tracking driver output is amplified and fed to the motor, but when the head is extended, switches TM5 and TM6 internal to Q104 control the ON/OFF.

7. Microcomputer peripheral circuit

Controlling is done with 2 microcomputer, and on the indicator printed circuit board, the master microcomputer is located. The primary operations are as shown in the following:

Master microcomputer Q401 (64 pin, 8K)

Key input processing	10 digit x 4 input
Display control	10 digit x 16 segment output
Remote control input processing	Serial input
Submicrocomputer control	4 bit parallel output
Subcode return (only at lead in time)	Serial input + clock

Submicrocomputer Q111 (42 pin, 4K)

Servo system controller	Serial output + clock
Mechanism controller	Starting output, input
Muting/emphasis control	Starting output
Subcode return	Serial input + clock, parallel output

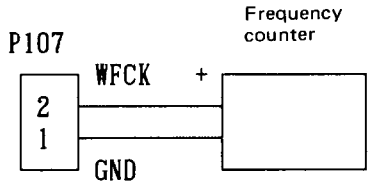
ADJUSTMENT PROCEDURES

Instruments required

Dual trace oscilloscope, Frequency counter, CR oscillator, Test disc (SONY YEDS-18), AC voltmeter, Sockets P107 & P105 (Part No.25050089) P106 (Part No. 25050138)

1. VCO frequency adjustment

Connect the frequency counter to terminal P107.
Turn the power switch to ON.(No load the disc).
Adjust R147 until the frequency counter reading becomes 7.35kHz.
After adjustment, disconnect the frequency counter.



2. Focus offset adjustment

Load the test disc (YEDS-18) on the tray and play back the track 2.
Connect the oscilloscope to terminal P105.
Adjust R110 until a clear trace of waveform pattern as shown photo 1 appear on the oscilloscope.
(When the amount of jitter is broad, set R110 to mechanical center)
After adjustment, disconnect the oscilloscope.

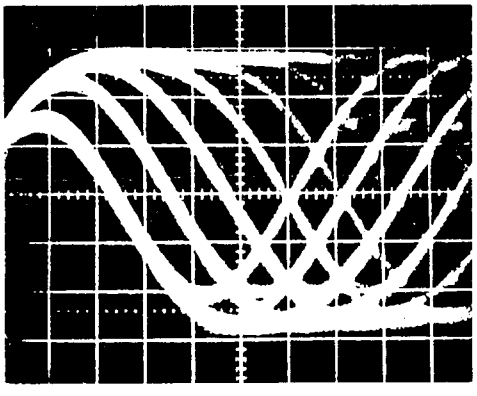
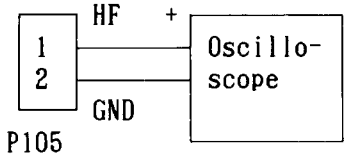


Photo 1



Oscilloscope range
Vertical: 0.2V/div
Holizontal: 0.2μS/div

3. Tracking offset adjustment

Play back the track 2 of test disc.
Turn R125 to minimum position(counter-clockwise).
Connect the oscilloscope between pin 3 (TR) of P106 and pin 2 (GND) of P105.
Adjust R108 until the center of tracking error signal on the oscilloscope becomes GND level.
Turn R125 to mechanical center.
After adjustment, disconnect the oscilloscope.

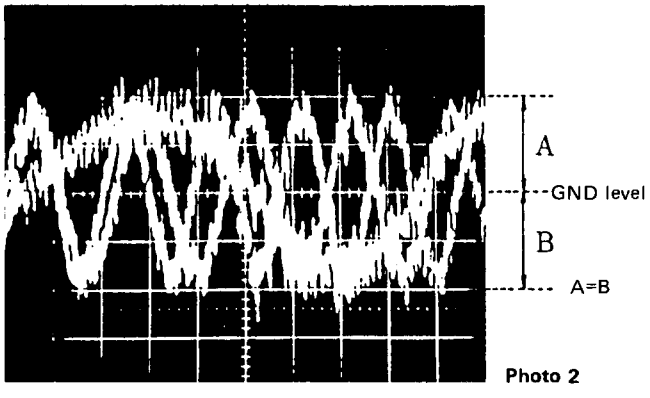
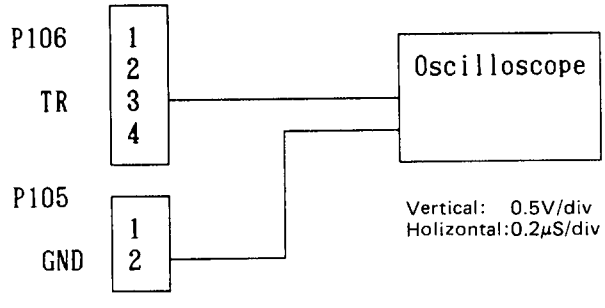


Photo 2



Vertical: 0.5V/div
Holizontal:0.2μS/div

4. Focus gain adjustment

Set the output of CR oscillator to 800Hz, 1~1.5Vp-p.
Play back the track 2 of test disc.
Connect the oscilloscope and the CR oscillator as shown below.

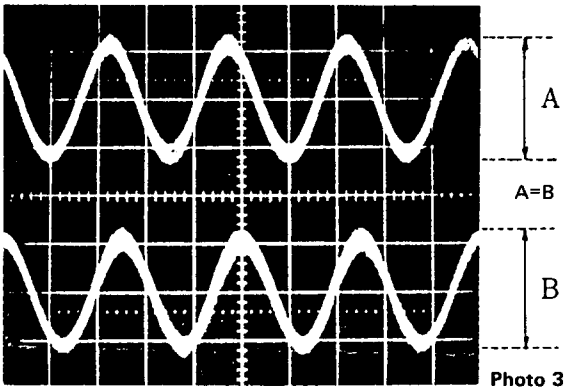
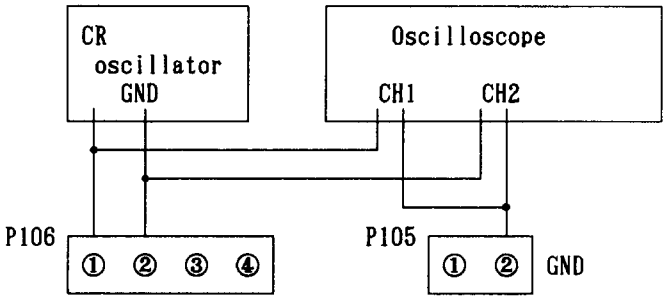


Photo 3



Vertical: 0.5V/div
Holizontal:0.5mS/div

Adjust R122 until 800Hz components of CH1 and CH2 on oscilloscope become same level.
After adjustment, disconnect the CR oscillator and the oscilloscope.

5. Tracking gain adjustment

Set the output of CR oscillator to 1.2kHz, 1~1.5Vp-p.
Play back the track 2 of test disc.
Connect the oscilloscope and the CR oscillator as shown below.

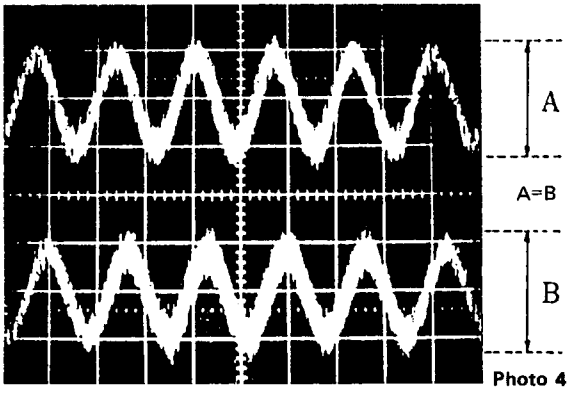
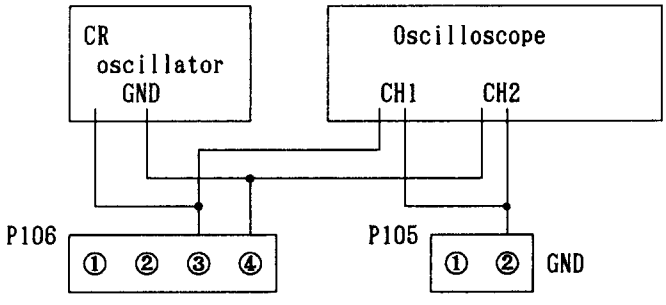


Photo 4



Vertical : 0.5V/div
Holizontal: 0.5mS/div

Adjust R125 until 1.2kHz components of CH1 and CH2 on oscilloscope becomes same level.

After adjustment, disconnect the CR oscillator and the oscilloscope.

6. Bet clock adjustment (BCLK adjustment)

Connect the oscilloscope to the test point BCLK.
Adjust R201 until the duty ratio of clock waveform becomes 1:1.

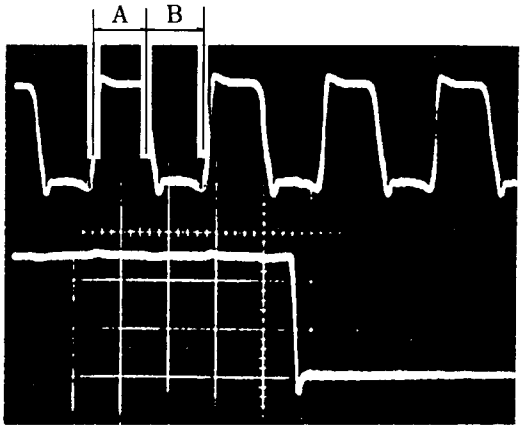


Photo 5

Vertical: 2V/div
Holizontal:0.1μS/div

7. Data waveform adjustment

Play back the track 2 of test disc.
Connect the channel 1 of oscilloscope to the test point DATA.
Connect the channel 2 of oscilloscope to the test point BCLK (synchronization signal).
Adjust R204 until the cross point of data waveform becomes 3V from below section.

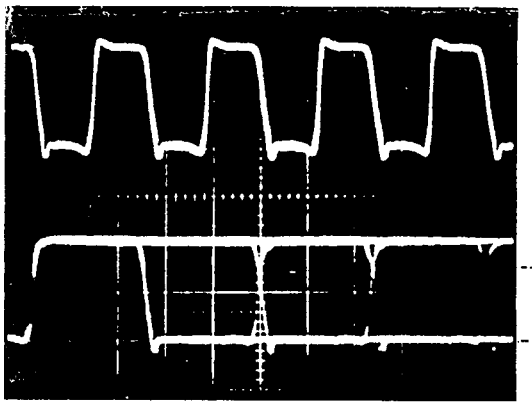
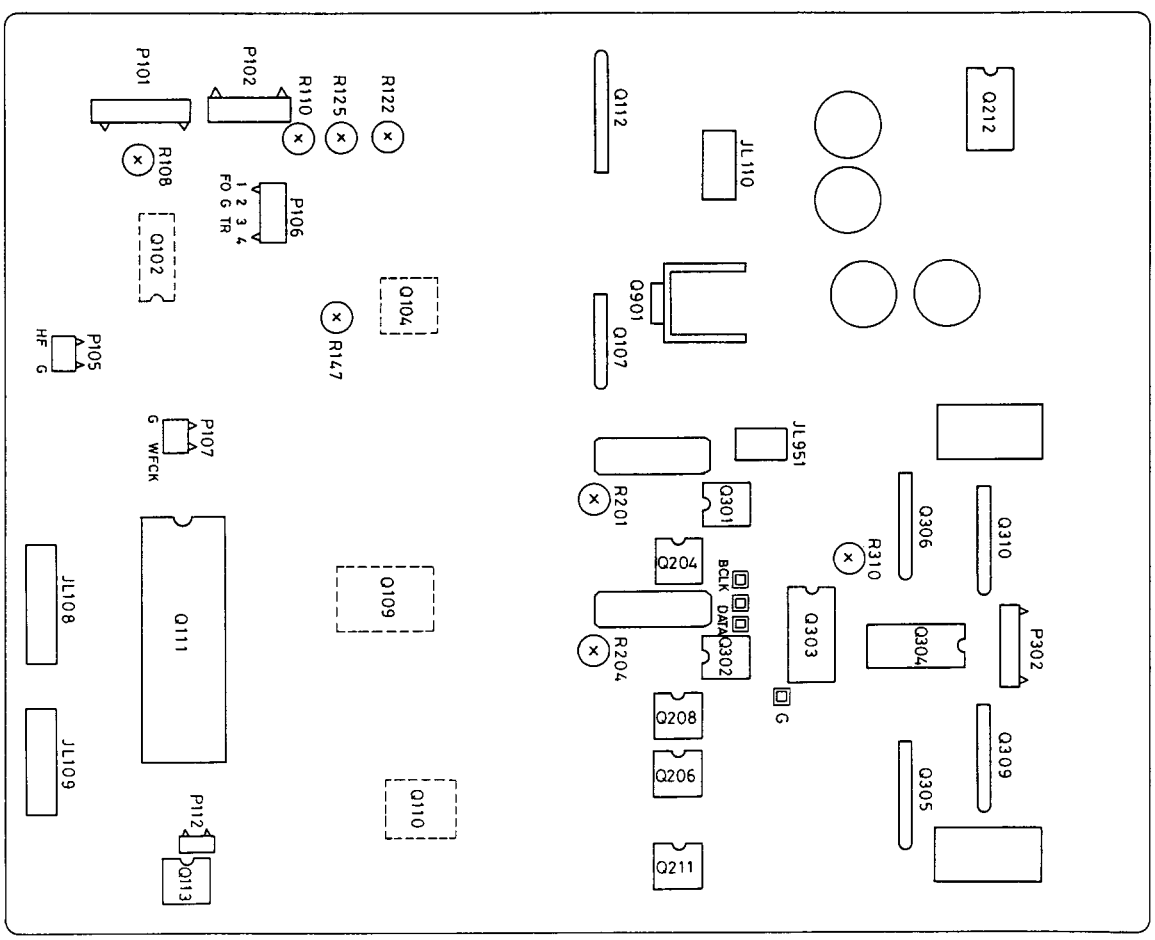
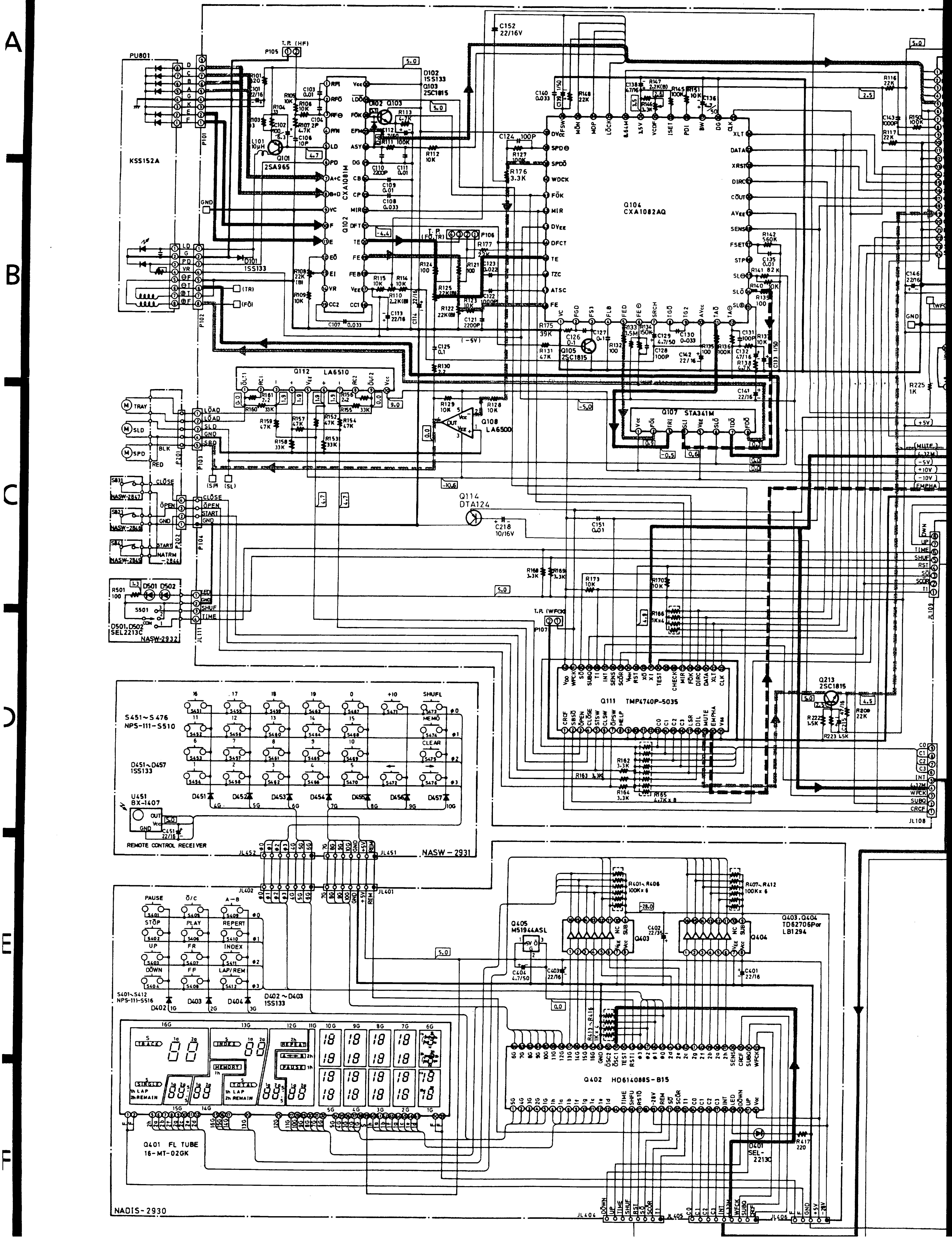


Photo 6

8. Zero cross distortion waveform adjustment

Connect the AC voltmeter to the audio output (L ch. or R ch.).
Adjust R310 until the playback level of track 17 becomes –60dB of playback level of track 2.




A
B
C
D
E
F
PU801
KSS152A
P101
P102
P105 T.P. (HF)
D101 1SS133
Q101 2SA965
L101 10µH
D102 1SS133
Q103 2SC1815
Q102 CXA1081M
RFI
RFO
RF⊖
P/N
LD
PD
A+C
B+D
VC
F
E
EO
EI
VR
CC2
CC1
VEE
FEB
FE
TE
DFT
MIR
CP
CB
DG
ASY
EFM
FOK
LDO
Vcc
P106 T.P. (FO, TR)
C152 22/16V
Q104 CXA1082AQ
FSW
MON
MDP
LOCK
8.64M
3.5V
VCDF
ISET
PDI
BW
DG
CLK
XLT
DATA
XRST
DIRC
COUT
AVEE
SENS
FSET
STP
SL⊖
SLO
SL⊕
DVcc
SPD⊖
SPDO
WDCK
FOK
MIR
DVEE
DFCT
TE
TZC
ATSC
FE
VC
FGD
FS3
FLB
FED
FE⊖
SRCH
TGO
TG2
AVcc
TAO
TA⊖
Q105 2SC1815
Q107 STA341M
Vcc
FOI
TRI
SLI
VEE
SLO
TDO
FDO
Q108 LA6500
Q112 LA6510
OUT1
RC1
VEE
RC2
OUT2
Vcc
M TRAY
M SLD
M SPD
BLK
RED
P201
P103
LOAD
SLD
GND
SPD
(SP)
(SL)
S831 NASW-2847
S821 NASW-2846
S84 NASW-2845
NATRM-2844
CLOSE
OPEN
START
GND
P202
P104
Q114 DTA124
C218 10/16V
C151 0.01
R501 100
D501 D502
S501
D501, D502 SEL2213C
NASW-2932
LED
GND
SHUF
TIME
JL111
T.P. (WFCK)
P107
Q111 TMP4740P-5035
VDD
WFCK
SO
SUBQ
T1
INT
SENS
SCOR
VHH
RST
XO
XI
TEST
CHECK
MIR
FOK
DIRC
DATA
XLT
CLK
CRCF
SBSO
OPEN
CLOSE
STSW
CLSW
OPSW
HELP
C0
C1
C2
C3
LSR
DIL
MUTE
EMPHA
VSS
R166 1K x 4
R165 4.7K x 8
Q213 2SC1815
C215 47/16
R209 22K
R222 1.5K
R223 1.5K
MUTE
4.32M
-5V
+10V
-10V
EMPHA
+5V
JL109
DOWN
UP
TIME
SHUF
RST
SO
SCOR
T1
JL108
C0
C1
C2
C3
INT
4.32M
WFCK
SUBQ
CRCF
S451~S476
NPS-111-S510
D451~D457
1SS133
SHUFL
MEMO
CLEAR
+10
U451
BX-1407
REMOTE CONTROL RECEIVER
C451 22/16
JL452
JL451
NASW-2931
JL402
JL401
PAUSE
O/C
A-B
STOP
PLAY
REPERT
UP
FR
INDEX
DOWN
FF
LAP/REM
S401~S412
NPS-111-S516
D402~D403
1SS133
D402
D403
D404
Q405 M51944ASL
C404 4.7/50
C403 22/16
C402 22/35
C401 22/16
R401~R406 100K x 6
R407~R412 100K x 6
Q403
Q404
Q403, Q404
TD62706P or LB1294
R413~R416 1K x 4
Q402 HD614088S-B15
D401 SEL-2213C
R417 220
TRACK
INDEX
REPEAT
MEMORY
PAUSE
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TOTAL
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2h REMAIN
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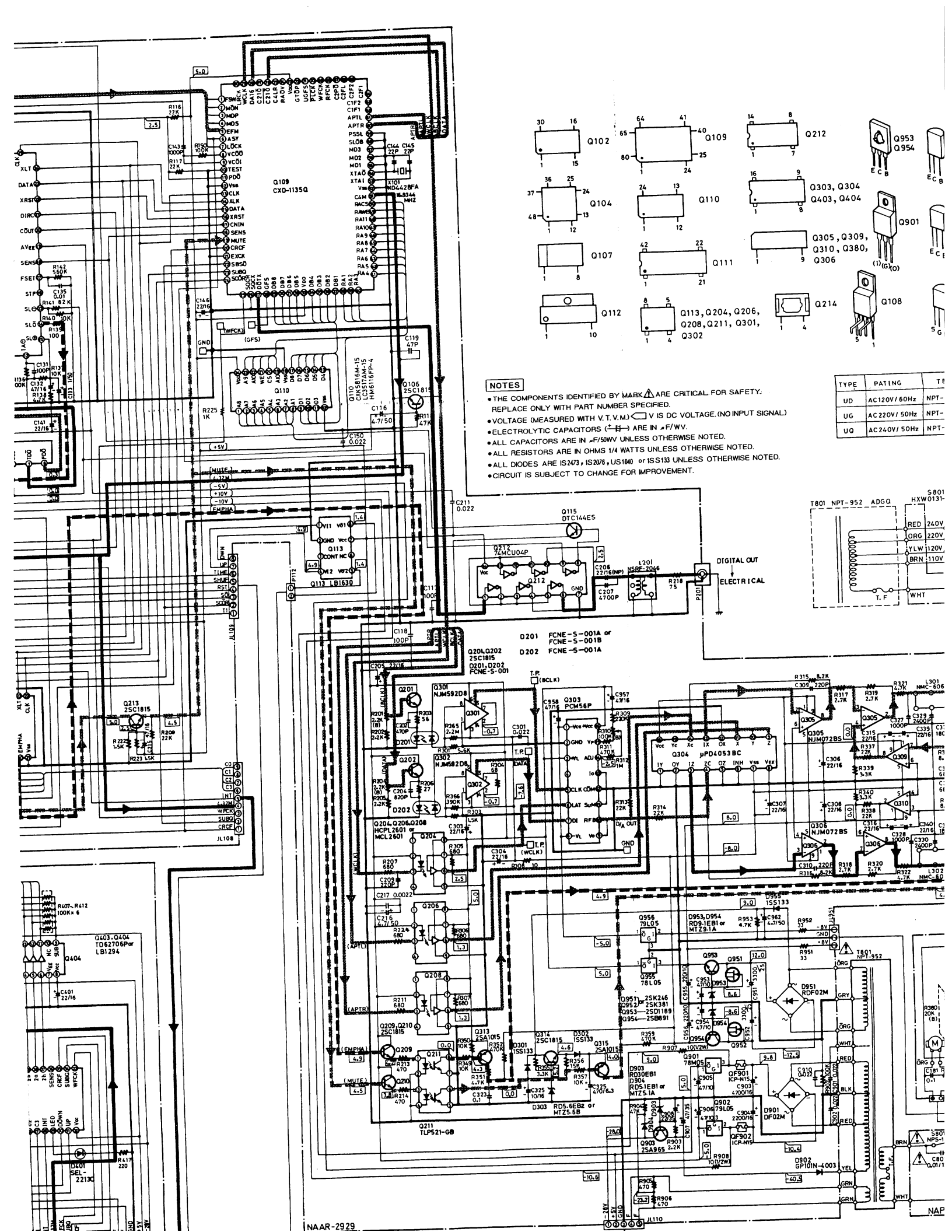
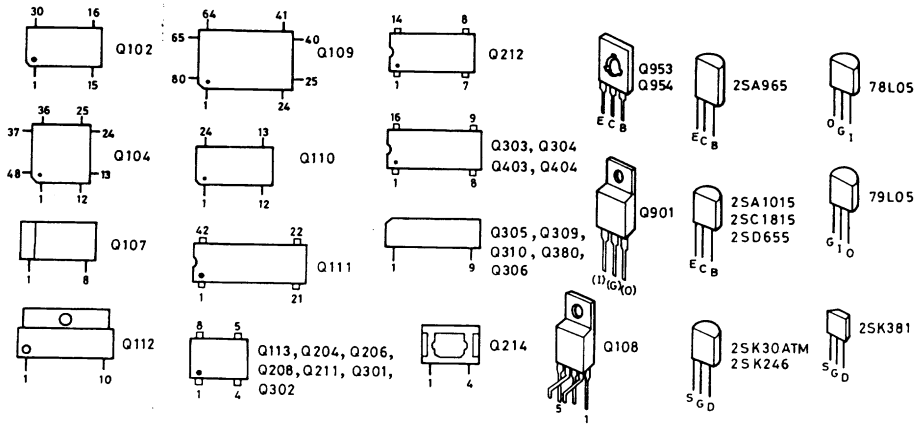
NADIS-2930
JL404
JL405
JL406


Q102
Q109
Q212
Q953
Q954
Q104
Q110
Q303, Q304
Q403, Q404
Q901
Q107
Q111
Q305, Q309,
Q310, Q380,
Q306
Q112
Q113, Q204, Q206,
Q208, Q211, Q301,
Q302
Q214
Q108
NOTES
•THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR SAFETY.
REPLACE ONLY WITH PART NUMBER SPECIFIED.
•VOLTAGE (MEASURED WITH V.T.V.M.) ⊏ V IS DC VOLTAGE. (NO INPUT SIGNAL)
•ELECTROLYTIC CAPACITORS (+ ⊣⊢ −) ARE IN μF/WV.
•ALL CAPACITORS ARE IN μF/50WV UNLESS OTHERWISE NOTED.
•ALL RESISTORS ARE IN OHMS 1/4 WATTS UNLESS OTHERWISE NOTED.
•ALL DIODES ARE IS2473, 1S2076, US1040 or 1SS133 UNLESS OTHERWISE NOTED.
•CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.
TYPE | PATING | T
UD | AC120V/60Hz | NPT-
UG | AC220V/50Hz | NPT-
UQ | AC240V/50Hz | NPT-
Q109 CXD-1135Q
Q110 CMK5816M-15 LC3517AM-15 HM6116FP-4
Q113 LB1630
Q115 DTC144ES
Q212 7ZMCU04P
Q201 FCNE-S-001A or FCNE-S-001B
Q202 FCNE-S-001A
Q204,Q202 2SC1815
D201,D202 FCNE-S-001
Q301 NJM5892D8
Q302 NJM5892D8
Q303 PCM56P
Q304 μPD4053BC
Q305 NJM072BS
Q306 NJM072BS
Q204,Q206,Q208 HCPL2601 or MCL2601
Q209,Q210 2SC1815
Q211 TLP521-GB
Q213 2SC1815
Q403,Q404 TD62706P or LB1294
Q956 79L05
Q955 78L05
Q953,Q954 RD9.1EB1 or MTZ9.1A
Q951 or 2SK246
Q952 2SK381
Q953—2SD1189
Q954—2SB891
D951 RDF02M
Q901 78M05
QF901 ICP-N15
QF902 ICP-M15
D901 DF02M
D902 GP10IN-4003
Q902 79L05
Q903 2SA965
D303 RD5.6EB2 or MTZ5.6B
D951 RD30EB1
D904 RD5.1EB1 or MTZ5.1A
T801 NPT-952 ADGQ
S801 HXW0131-
RED 240V
ORG 220V
YLW 120V
BRN 110V
WHT
T. F
P201
DIGITAL OUT
ELECTRICAL
JL108
JL110
NAAR-2929



NOTES

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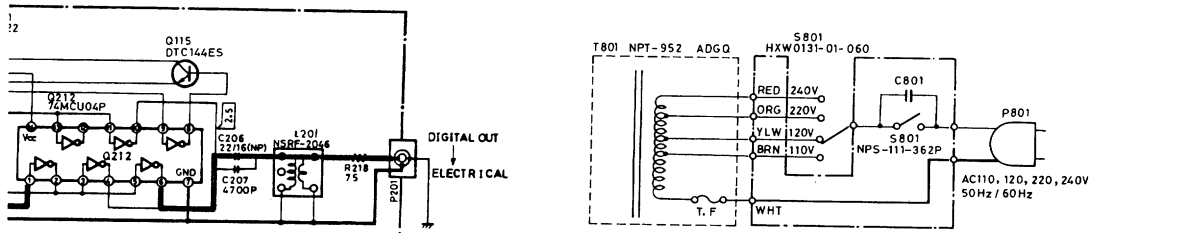
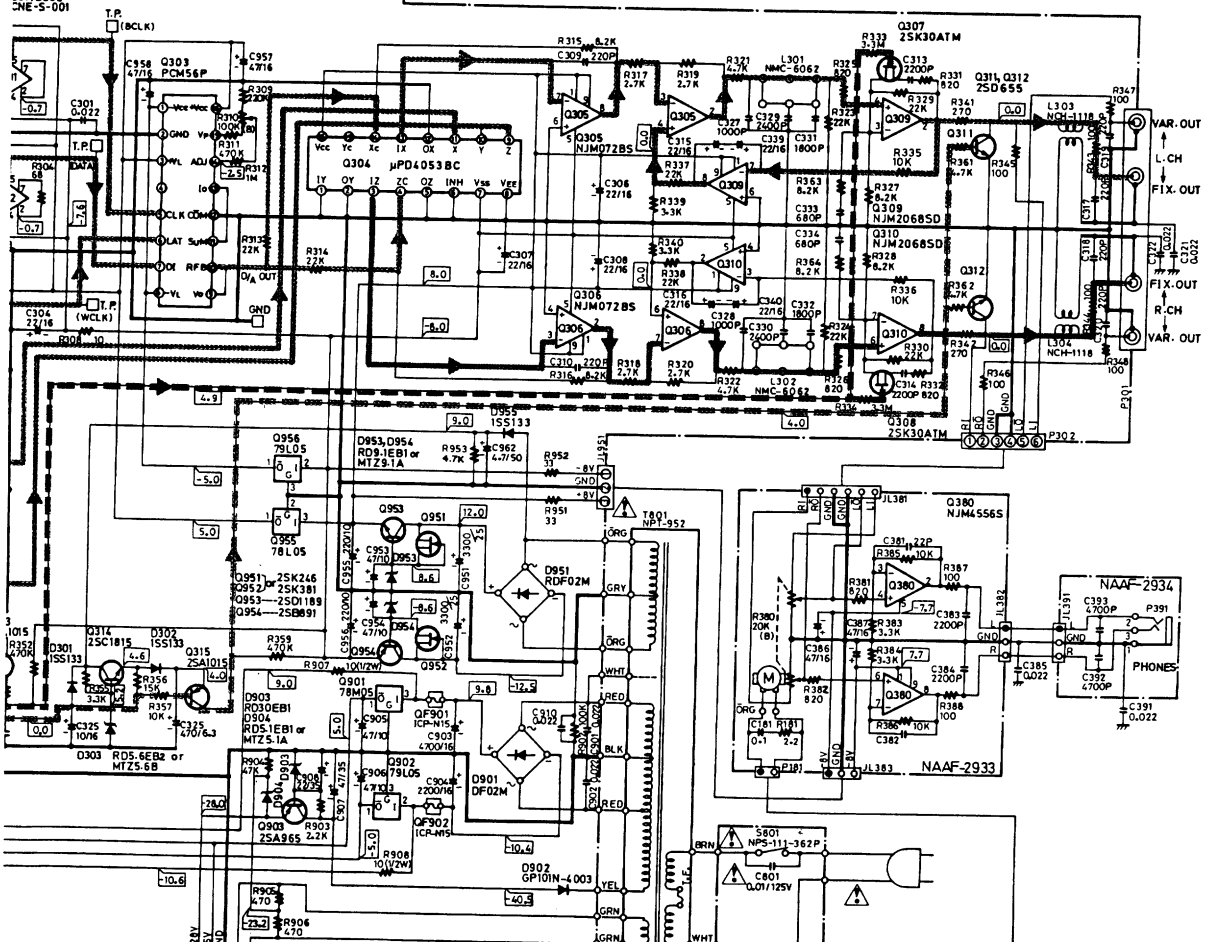
- ALL RESISTORS ARE IN OHMS 1/4 WATTS UNLESS OTHERWISE NOTED.
- ALL DIODES ARE IS2473, 1S2076, US1040 or 1SS133 UNLESS OTHERWISE NOTED.
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

TYPE	PATING	T801	PRIMARY LEAD WIRE	C801
UD	AC120V/60Hz	NPT-952D	YLW	0.01μF/125V
UG	AC220V/50Hz	NPT-952G	ORG	0.01μF/400V
UQ	AC240V/50Hz	NPT-952Q	RED	0.01μF/400V



D201 FCNE-S-001A or FCNE-S-001B
D202 FCNE-S-001A



PRINTED CIRCUIT BOARD – PARTS LIST

MAIN CIRCUIT PC BOARD (NAAR-2929-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs	
Q102	22240029	CXA1081M
Q104	22240030	CXA1082AQ
Q107	22240036	STA341M
Q108	22240033	LA6500
Q109	22240031	CXD1135Q
Q110	222990, 222882 or 22240032	CXK5816M-15, HM6116FP-4 or LC3517AM-15
Q111	222948	TMP4740P-5035
Q112	22240034	LA6510
Q113	222963	LB1630
Q204, Q206	226027 or	HCPL2601 or
Q208	226026	MCL2601
Q211	2412002	TLP521-2GB
Q212	222755	74HCU04P
Q301, Q302	22240035	NJM592D8
Q303	222988	PCM56P
Q304	222717	μPD4053BC
Q305, Q306	22240010	NJM072BS
Q309, Q310	22240020	NJM2068SD
Q901	222780052	78M05
Q902, Q956	222790053	79L05
Q955	222780053	78L05
	Transistors	
Q101	2211643 or 2211644	2SA965(O) or 2SA965(Y)
Q103, Q105	2211254 or 2211255	2SC1815(Y) or 2SC1815(GR)
Q106	2211255	2SC1815(GR)
Q114	2212600	DTA124ES
Q115	221282	DTC144ES
Q201, Q202	2211254 or	2SC1815(Y) or
Q209, Q210	2211255	2SC1815(GR)
Q213	2211254 or 2211255	2SC1815(Y) or 2SC1815(GR)
Q307, Q308	2212375	2SK30ATM(GR)
Q311, Q312	2211705 or 2211706	2SD655(E) or 2SD655(F)
Q313, Q315	2211454 or 2211455	2SA1015(Y) or 2SA1015(GR)
Q314	2211254 or 2211255	2SC1815(Y) or 2SC1815(GR)
Q903	2211643 or 2211644	2SA965(O) or 2SA965(Y)
Q951, Q952	2212304 or 2211945	2SK381(D) or 2SK246(GR)
Q953	2201594 or 2201595	2SD1189(Q) or 2SD1189(R)
Q954	2201604 or 2201605	2SB891(Q) or 2SB891(R)
	Photo couplers	
D201	24120005 or 24120006	FCNE-S-001A or FCNE-S-001B
D202	24120005	FCNE-S-001A
	Diodes	
D101, D102	223163	1SS133
D301, D302	223163	1SS133
D303	2239472 or 2243152	RD5.6EB2 or MTZ5.6B
D901	223892	DF02M
D902	223880	GP101N4003
D903	2239811	RD30EB1
D904	2239451 or 2243141	RD5.1EB1 or MTZ5.1A
D951	22380013	RDF02M
D953, D954	2239571 or 2243201	RD9.1EB1 or MTZ9.1A
D955	223163	1SS133
	X'tal	
X101	3010112	KD6586FFB
	Coils	
L101	231023	NCH-1062
L201	232136	NSRF-2046
L301, L302	232134	NMC-6062
L303, L304	231066	NCH-1118
	Capacitors	
C101	354742209	22μF, 16V, Elect.
C102	354721019	100μF, 6.3V, Elect.
C112	354780479	4.7μF, 50V, Elect.
C113, C114	354742209	22μF, 16V, Elect.
C116, C129	354780479	4.7μF, 50V, Elect.
C132	354744709	47μF, 16V, Elect.
C133	354780109	1μF, 50V, Elect.
C136	354780479	4.7μF, 50V, Elect.
C138	354744709	47μF, 16V, Elect.
C141, C142	354742209	22μF, 16V, Elect.
C146, C205	354742209	22μF, 16V, Elect.
C152, C206	352942206	22μF, 16V, Non-polar elect.
C215	354744709	47μF, 16V, Elect.
C216	354780479	4.7μF, 50V, Elect.
C218	354741009	10μF, 16V, Elect.
C303, C304	354742209	22μF, 16V, Elect.
C306-C308	354742209	22μF, 16V, Elect.
C309, C310	372522214	220pF ±5%, 50V, Styrole
C315, C316	391242209	22μF, 16V, Elect.
C317-C320	372522214	220pF ±5%, 50V, Styrole
C324	354741009	10μF, 16V, Elect.
C325	354724719	470μF, 6.3V, Elect.
C339, C340	391242209	22μF, 16V, Elect.
C903	354744729	4700μF, 16V, Elect.
C904	354742229	2200μF, 16V, Elect.
C905, C906	354744709	47μF, 16V, Elect.
C907	354784709	47μF, 50V, Elect.
C908	354762209	22μF, 35V, Elect.
C951, C952	352753329	3300μF, 25V, Elect.
C953, C954	354744709	47μF, 16V, Elect.
C955, C956	354742219	220μF, 16V, Elect.
C957, C958	354744709	47μF, 16V, Elect.
C962	354780479	4.7μF, 50V, Elect.
	Resistors	
R108	5210066	N06HR22KBD, Semi-fixed
R110, R147	5210060	N06HR2.2KBD, Semi-fixed
R122, R125	5210066	N06HR22KBD, Semi-fixed
R165	49121472408	4.7kohmX8, 1/8W, Network
R166	49121102404	1kohmX4, 1/8W, Network
R201, R204	5210009	N06HR2.2KBDM, Semi-fixed
R310	5210070	N06HR100KBD, Semi-fixed
R907, R908	442521004	10ohm, 1/2W, Metal oxide film
	Plugs	
P101	25055153	NPLG-9P137
P102	25055152	NPLG-8P136
P105, P107	25055038	NPLG-2P29

P106	25055045	NPLG-4P33
P112	25055132	NPLG-2P116
P302	25055136	NPLG-6P120
	Sockets	
P103	2000444	NSAS-5P403
P104	2000653	NSAS-4P609
P108	25050273	NSCT-9P101
P109	25050272	NSCT-8P100
P110	25050269	NSCT-5P97
P111	25050268	NSCT-4P96
P951	25050267	NSCT-3P95
	Terminals	
P201	25045220	NPJ-1PDOR97
P301	25045201	NPJ-4PDBL82
	Fuses	
F901, F902	252112	⚠ ICP-N15-0.6A
	Radiator	
	27160029	RAD-07
	Screw	
	82143006	3P+6FN(BC), Pan head
	Cushion	
	28140772	

DISPLAY PC BOARD (NADIS-2930-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
	Fluorescent tube	
Q401	212038	16-MT-02GK
	ICs	
Q402	22240045	HD614088S-B15
Q403, Q404	22240037	TD62706P
Q405	22240038	M51944ASL
	L.E.D	
D401	225141	SEL2213C
	Diodes	
D402-D404	223163	1SS133
	Capacitors	
C401, C403	354742209	22μF, 16V, Elect.
C402	354762209	22μF, 35V, Elect.
C404	354780479	4.7μF, 50V, Elect.
	Resistors	
R401-R406	49121104406	100kohmX6, 1/8W, Network
R407-R412	49121104406	100kohmX6, 1/8W, Network
R413-R416	49121102404	1kohmX4, 1/8W, Network
	Switches	
S401-S412	25035554	NPS-111-S516
	Holders	
	27190516A	
	27190517A	L.E.D
	Screws	
	833430080	3TTP+8P(BC), Tapping screw

OPERATION SWITCH PC BOARD (NASW-2931-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
	Opto. module	
U451	241068	BX-1407
	Diodes	
D451-D457	223163	1SS133
	Capacitor	
C451	354742209	22μF, 16V, Elect.
	Switches	
S451-S476	25035548	NPS-111-S510

TIMER SWITCH PC BOARD (NASW-2932-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
D501, D502	225142	SEL2913K, L.E.D
S501	25065224	NSS-2398, Slide switch
	27190515B	Holder, L.E.D

OUTPUT VOLUME PC BOARD (NAAF-2933-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
Q380	222887	NJM4556S, IC
C386, C387	354744709	47μF, 16V, Elect. Capacitors
R380	5148116	N16RGL20KA20, Variable resistor
SC181	2000654	NSAS-2P610, Socket
SC381	2000675	NSAS-6P631, Socket

HEADPHONE TERMINAL PC BOARD (NAHP-2934-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
P391	25045139	HLJ0541-01-010, Terminal

POWER SWITCH PC BOARD(NAPS-2936-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
S801	25035398	⚠ NPS-111-S362P, Power switch
C801	3500065A	⚠ 0.01μF, AC125V/400V, Capacitor IS
	27300601	⚠ Cover for C801

NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.